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A METHOD OF CUTTING AND SUTURING THE LIP IN THE TREATMENT OF COMPLETE UNILATERAL CLEFTS*

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In a complete unilateral hare-lip the cleft is usually pretty wide. This width is due almost entirely to the spreading apart of the processes that should normally have fused. There is very little real lack of tissue and if, at the operation, enough freeing is done on both sides, tissue enn be obtained that is sufficient in nmount but is, as it were, in the wrong place. The cleft is widest in its lower pnrt, and to form a decent looking lip with the desired pouting appearance one of the chief problems is to get sufficient tissue where it is needed, that is at the lowest edge of the lip.

Mirault gets the credit of being the first to solve this difficulty in 1844 by cutting n flap extending well up one margin of the cleft and by swinging it down and over to the other side (Fig. 1). Since then several modifications of the principle have been described by various writers. In 1930 Blair and Brown (1) described an operation that utilized this principle. They called it the 'Mirault operation' although it was a great advance on anything that Mirault had described and it included a lot about the treatment of the nasal distortion that was probably not even dreamed of in Mirault's day. What is being presented here is a slightly different method of utilizing this flap principle and, as it is not intended to say anything about the nose, it is really nothing more than a modification of the Mirault operation and should not be known under any other name. Further Hagedorn in 1892 described an operation very similar to the one presented to-day (Fig. 2). It would seem therefore that the only things that ean be claimed as at all new in this presentation are the details worked out for the doing of the operation.

The flap is cut from the lateral side of the cleft nnd we hnve found it simpler and, in some ways, better to cut this flap in a more or less quadrilateral shape and, after swinging it down nnd over, to make it fit on the medial side into n noteh formed by the spreading npart of the two edges of a cut (Fig. 3). If the flap is made to extend fnr enough up the side of the cleft it will reach the mid-line, and the suture line will be in the centre of the lip, which is an ndvantage. The opening up of the cut on the medinl side turns down the mueo-cutaneous line here, and the swinging down of the quadrilateral flap does the same on the lateral side. A eupid's bow is thus formed which ean be made of almost nny height and, what is more important, can, with eare, be made symmetrical on the two sides, with the two parts of the mueo-eutaneous line meeting nccurately.

There are several points about this operation, most of which have been learned the hard way. If any cupid's bow is attempted it is better, if possible, to hnve the suture line in the eentre of the lip, corresponding to the peak of the bow.

The difficulty here is to get the lateral flap long enough to reach the mid-line. On this side the mucous membrane peters out well below the top of the cleft.

MIRAULT, 1844 (SMITH 1852)
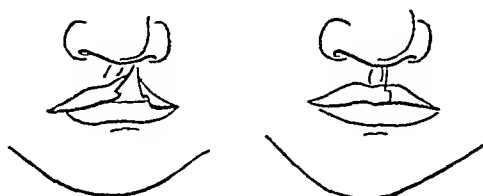
MIRAULT, 1871 (VEAU)

Fig. 1
Diagrams available to show Mirault's operation
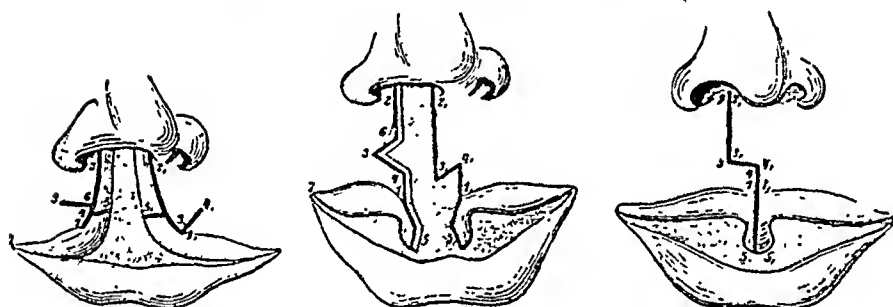
HAGEDORN, 1892 (JOSEPH)

Fig. 2
Hagedorn's operation
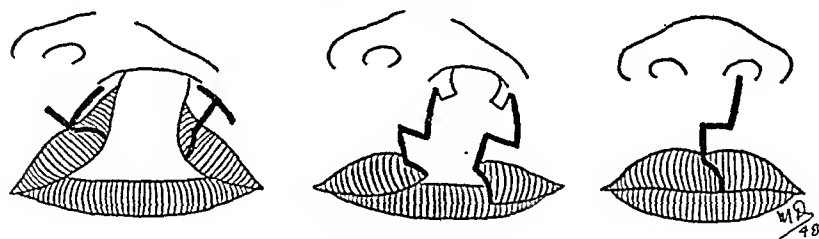
Fig. 3
Stages of the operation

Some mucous membrane is necessary on the flap, even to its end, but it need not be of quite the full thickness throughout, as there is always enough on the other

side to make up for any minor defect. The flap, therefore, is cut as high as is practical, that is, with its top at the level where the mucous membrane is beginning to become thin but where there is still enough present to work with. If the flap is made to extend high enough and the cuts on the other side are of the proper length, the lower part of the suture line will be in the mid-line of the lip or close enough to it to be acceptable.

One of the most important things, and certainly one of the most difficult, is to get the two sides of the lip symmetrical. To start with, the cleft is not in the mid-line, the two parts of the lip are entirely different in shape and both are cut in very different ways. Under these conditions it seems rather unlikely that any symmetry can be depended on. However, while the width of the cleft may vary considerably in different cases, the two sides of the lip are usually pretty
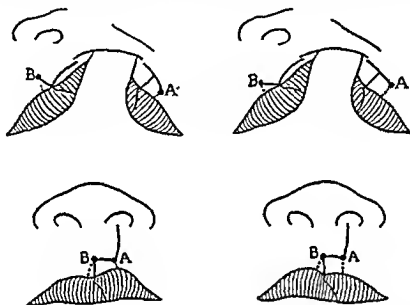
Fig. 4

~~The~~ ~~...~~ ~~...~~ ~~lateral side this height depends~~
~~e. On the medial side it de-~~
~~is placed.~~

constant in their form, and, if a few rules are followed, a fair degree of symmetry may be expected. Besides getting the peak of the cupid's bow in the mid-line, the curve of the two sides should be as nearly of the same height and same pattern as possible. There are several factors that determine the shape of the bow but there are two that concern us most. One is that the height of the bow on either side depends largely on the distance between the muco-cutaneous line and the two points at either end of the transverse part of the Z-shaped wound (Fig. 4, A and B). These points are practically fixed points and if, in the cutting, one is placed too close to the muco-cutaneous line, the curve on this side will be too high. On the lateral side, the flap should be cut so that its base is only slightly narrower than its end, unless a high curve is desired on this side. On the medial side the direction of the transverse cut is important and, to get a moderate curve, its extreme end should be placed above the muco-cutaneous line only slightly less than its length. The closer it is to this line the higher the

curve here will be. The other thing that has a lot to do with the shape of the curve, particularly just near the mid-line, is the angle at the peak of the flap on either side. As this part of the suture line is pretty vertical the two angles should be about the same and, to get a moderate bow (Fig. 5A), should each be slightly less than a right angle. If they are too acute (Fig. 5B), the peak of the bow will be too sharp and if they are too obtuse (Fig. 5C), there will be almost a notch instead of a peak in the mid-line. If the two angles are very different
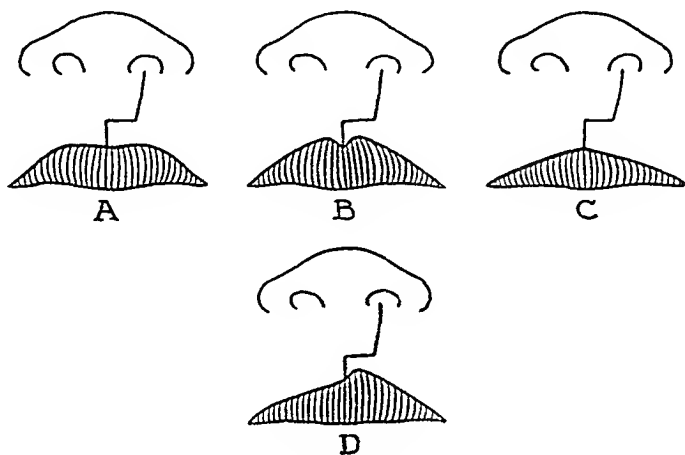
Fig. 5

The angles at the peak of the flaps on the two sides. A. These angles should be equal and to make a moderate cupid's bow should be each slightly less than a right angle. B. If these angles are too acute, the peak of the cupid's bow will be too sharp. C. If these two angles are too obtuse there will be no peak to the cupid's bow. D. If these two angles are very unequal, the bow will be asymmetrical near the mid-line.
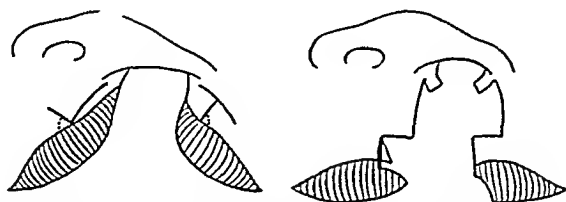
Fig. 6

The angle at the peak of the flap on either side becomes more acute as the flap is rotated down. On the medial side it is sometimes necessary to trim this angle to make it less acute.

(Fig. 5D), there will be a fairly marked asymmetry in the bow. However, both flaps when they are sutured are rotated downward through a considerable degree (Fig. 6). Their shape is changed and the angle at their peak becomes more acute. When the lateral flap is cut, the angle at the muco-cutaneous line should be a right angle or even slightly obtuse, and when the flap is turned down this angle will become slightly acute. On the medial side, when the cuts are made as described, the angle at the peak is sometimes too acute and this point has often to be trimmed to make the angle only slightly less than a right angle.

When the operation was first done quite a marked cupid's how was attempted with often a noticeable asymmetry on the two sides. We still attempt to make a definite bow hut even in the girls we try to keep the curve moderate and find that in doing this we get the two sides more symmetrical.

With this operation the vertical height of the lip can he made to vary considerably. This height depends chiefly on the length of the cuts that are sutured in the vertical position—the cut extending downward from the top point to the base of the flap and the cut that marks the end of the flap. The lip can be made too long (Fig. 7A), and consequently too tight from side to side, hy having the

A   B

Fɪo. 7
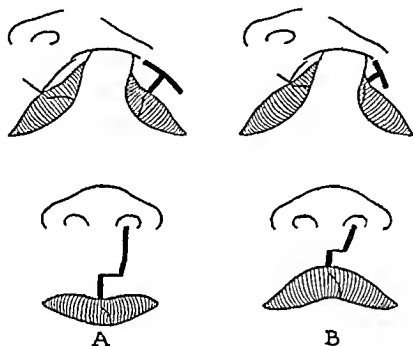
The v : . . . .
flap too l . . . .
small . . . .

flap too low, which means that the upper vertical cut has to he long, or hy cutting the flap too large, which means that the lower vertical part of the sutured wound will be long. On the other hand the lip can he made too short (Fig. 7B) hy having the flap too high or too small. If the lip is short in the mid-line it is difficult to get any appreciable peak to the cupid's bow. As the general appearance of the lip depends so much on its being of the proper length, a definite attempt should be made to get it at the hest length hy cutting the lateral flap at the right level and of the right size.

With adequate freeing on both sides there should he no difficulty in placing the two cut edges together without tension. The lip, when the sutures are completed, has practically the normal fullness and usually something of the normal pouting appearance of an infant's lip. This pouting can he made more marked hy cutting the lateral flap slightly longer than the cut to which it is sutured (Fig. 11).

The most important points then, in doing this operation, are to cut the lateral flap high cnough up the side of the cleft, to have it of the hest size and shape,

and to have the cuts on the medial side of the proper length and at the proper
angles so that the cut surfaces will fit accurately when sutured.   So much de-
pends on the position and size of the lateral flap that we now outline all the cuts
on the lateral side first and make the cuts on the medial side correspond to them.
Having picked the two top points at the margin of the nostril (Fig. 8, A and B),
the first thing done is to outline the top of the lateral flap.   A point (C) is picked
on the muco-cutaneous line as high up the side of the cleft as is practical, op-
posite mucous membrane that is slightly less than the full thickness but is still
thick enough to work with.   From this point a line (CD) is drawn perpendicular
to the muco-cutaneous line.   It is difficult to describe the best length for this
line but it should be about as shown in the diagram.   In a well-developed infant
about three months old, the age at which we prefer to do this operation, this
line is approximately three-sixteenths of an inch in length.   It is better, when
this line is made, to extend it across the muco-cutaneous line definitely into the
mucous membrane.   A second line is drawn from the top point to the end of
this first line and then continued downward for the same length as the first line.
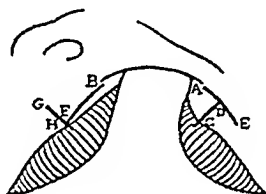
FIG. 8
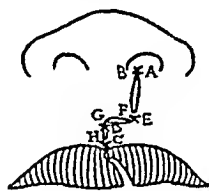
FIG. 8
Details of marking out cuts on two sides.   See text
FIG. 9
Triming of mucous membrane after partial closure by sutures.

This second line (ADE) is somewhat curved to produce a slight pouting in the
upper part of the lip and to make the base of the flap slightly narrower than its
end.   On the medial side the upper vertical line is drawn downward from the top
point with the same slight curve and of the same length as the corresponding line
on the lateral side.   This medial line (BF) ends at a point slightly on the skin
side of the muco-cutaneous line.   From this point a transverse line (FG) is
drawn somewhat upward so that its end (G) is only slightly closer to the muco-
cutaneous line at its nearest point than its length.   Theoretically, this line should
be of exactly the same length as the two cut sides of the lateral flap (CD and
DE).   However, if it is measured from the muco-cutaneous line, and drawn
from the end of the vertical cut, which is slightly on the skin side of this line,
its upper edge (FG) will be slightly shorter than the length of the lateral flap
(ED) and, when the suturing is done, a fairly sharp pout will be produced at
this level.   As was said before, the angle between this line and the muco-cu-
taneous line is sometimes too acute and the corner of the flap has to be trimmed
off to make the angle slightly less than a right angle (Fig. 6).   In doing this no
length should be sacrificed as this cut (GH) has to fit the corresponding cut on

the lateral side (DC) to make the two parts of the muco cutaneous line meet accurately When this cut is at the proper angle it should be extended across the muco-cutaneous line definitely into the mucous membrane It is, however, better to delay any further trimming of the mucous membrane on both sides until the suturing is partly completed (Fig 9), until at least the key sutures, the ones at the rim of the nostril, at both angles and just above the muco cutaneous line, have been inserted At this stage it is much easier to cut away the mucous membrane on the lateral side until its full thickness is reached and to cut on the medial side a slap that fits accurately In the complete clefts there is always enough mucous membrane available and in many of the early cases too much was left and a redundant fold had to be removed later
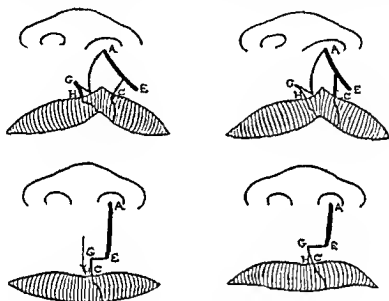
FIG 10

What has been said so far applies to complete unilateral clefts Practically the same operation can be done for the incomplete clefts The main difference between the two is that, in an incomplete cleft, the flap cannot be made to extend as far up the cleft If the cleft is anywhere nearly complete this does not matter much but, if it consists of merely a notch, the flap cannot be made long enough to reach the mid line The suture line is to the cleft side of the centre of the lip and is not where the peak of the cupid's bow should be (Fig 10) This difficulty can be overcome by cutting the edge of the medial flap (GH) in a curved direction so that when sutured, the lowest point of the muco cutaneous line will form a slight peak in the centre of the lip to the medial side of the suture line Another difference in these incomplete clefts, when the flap has to be low, is that the vertical cut has to be long and the whole lip may be made too long The vertical cut can be made shorter by cutting the angle at the peak of the lateral flap (C) more obtuse and by cutting the corresponding angle on the medial side

Fig 11

Rather excessive pouting produced by cutting the lateral flap too long. Before and 7 years after operation.

Fig 12

Complete unilateral cleft, before and 12 days after operation.

(H) more acute. As a matter of fact this operation is just as satisfactory with incomplete as it is with complete clefts.

This particular operation was first done in November, 1935, and since then, at the Hospital for Sick Children, it has been done on approximately 475 pa-

tients with unilateral clefts, either complete or incomplete. In none of these cases has there been any sloughing of the narrow-based flap, and the blood
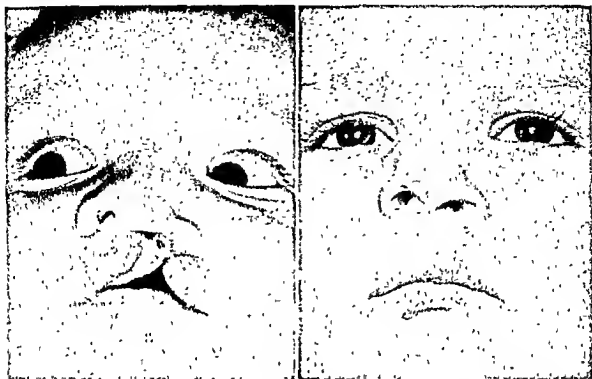
Fig. 13
Complete unilateral cleft, before and 2½ years after operation.

Fig. 14
Complete unilateral cleft, before and 5 years after operation.

supply of this flap has always been excellent, even to its tip. In only two cases have the wounds broken open completely. In both the breaking down occurred

to produce any distortion and does not need to be allowed for at the operation. The turning down of the fairly large flap does not disturb the action of the muscles very much, and these children can smile about normally and can whistle if the cleft in the palate is repaired (Fig. 18).

Not all the results in this fairly large series have been good. In a few cases a second operation has been done, usually for an unsightly jog at the muco-cutaneous line or for an excessive fold of mucous membrane, but these faults could have been avoided at the original operation. On the whole, the results, as far as the appearance of the lip itself goes, have been good, probably better on the average than the result obtained by other methods. In most cases the child is left with a lip that is of normal fullness and has the desired pouting appearance, with a cupid's bow that is more or less symmetrical, and these appearances remain as the child grows. The characteristic and unsightly hare-lip appearance is lost. The lip may not be perfect but, when seen across a room, it seldom looks as though it had ever been a hare-lip. The operation itself has the advantage of being comparatively simple. There is not much about it that can go wrong, and in our hands it has been more satisfactory than any other method we have tried.

<div align="center">REFERENCE</div>

1. BLAIR, VILRAY P., AND BROWN, J. B.: Surg., Gynec. & Obst., 1930, LI, 81.

MAMMAPLASTY FOR PENDULOUS BREASTS

EMPIRIC AND GEOMETRIC PLANNING*

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Any reconstructive operation on a woman's breast is a major surgical one—a major problem in technic and in esthetics. It presupposes on the part of the surgeon, not only a profound knowledge of the anatomic structure of the breast but an artistic awareness of the plastic material he is utilizing. Above all he must keep in mind that the contours of the pendent breasts change with the position of the body owing to the semi soft consistency of the glands and their limited attachment to the thoracic wall. Definite measurements of the gland, which is so variable in consistency and proportions, manifestly present certain difficulties. It is readily understood that the task of transforming unshapely oversized breasts into smaller, well proportioned, symmetric breasts, is one of great complexity. Owing to the variable characteristics, certain precautions must be observed. They are (1) Fixation landmarks should be considered in relation to the thorax, (2) allowance should be made for the elasticity of the skin and the effect of breast weight on it, skin markings should be controlled and compared in the standing and in the recumbent positions, (3) measurements of both breasts should be made under similar conditions to produce symmetry.

In the evolution of mammaplasty technics various single abstract geometric figures, measurements and calculations were devised by surgeons and used so to say, as instruments for the closest possible approximation of the gland, nipple and areola, to the normal contour, size and placement. Many surgeons only use their eyes and digital estimations in a mammaplastic procedure.

In the following pages a system of practical and esthetic principles partly derived from standard procedures, is summarized. The combined features consist of a one stage operation carried out simultaneously on both breasts and transposition of the nipples rather than free transplantation. The technic it seems to me, has the advantages of simplicity, reasonable avoidance of complications (necrosis, for example), the saving of time and greater observance of esthetic and physiologic principles.

No inflexible rules or unchangeable "blueprints," metric or geometric, are offered or implied for surgical planning in mammaplasty. There remains a certain degree of latitude, based on accepted standards, in choice of modelling the mammae.

In the evolution of various technical plans (as in the field of general surgery) there will be, as always, further refinements.

As a rule it is possible to achieve the desired reduction in size and form in a one stage operation, except, occasionally in extremely largely pertrophied breasts

CERTAIN ANATOMIC CONSIDERATIONS

According to the standard textbooks of anatomy the position of the breast is variously described. The limits as given by different authors range from the second or third rib to the sixth or seventh rib, and the width from about the parasternal line to the midaxillary line. The consistency of the breast varies greatly depending on the glandular component and surrounding fat. To a degree it also depends on the relation between the extent of skin covering and the breast tissue proper.

The main sources of mammary blood supply have been frequently described in great detail. According to Deaver (Surgical Anatomy) they are: (1) Long (lateral) thoracic; (2) the short thoracic; (3) the pectoral branches of the acromiothoracic (thoraco-acromial); (4) the perforating branches of the internal mammary; and (5) the mammary branches of the intercostal arteries. The vascularization is neither unchangeable nor symmetric in both breasts. In the light of my experience and admittedly contrary to what is generally emphasized in discussions regarding mammaplasties, reliance on, or avoidance of, a particular branch of the mammary arterial tree has no practical value. From the surgical point of view all breast tissues are well vascularized. There is a sufficient blood supply from any direction of the breast hemisphere to nourish the corresponding tissue.

As a rule we treat breast tissue in remodelling operations on general principles similar to those which guide us when preparing a skin flap; in other words, to provide a sufficient nourishing pedicle to the remaining part of the gland, no matter on which side or how extensive an excision is made. For the protection of the blood supply in the areola and nipple a broad central axis of breast tissue must remain intact and deep excision is not made through more than one aspect of the breast at the same operation.

ESTHETIC CRITERIA

The esthetic aims in reconstructing a breast are: normal size, form, position, symmetry, and inconspicuous scarring. Ordinarily no attempt is made to form a virgin or adolescent breast with equal radii because: (a) It is not the usual contour of the average adult woman; (b) scars on the more exposed lower surfaces are conspicuous and (c) in time the reconstructed breasts sag, leaving the nipple too highly placed. The formation of a gently pendent, mature breast should rather be the aim of plastic reconstruction. Besides its normal appearance, the form is more lasting and the scars on the under surface are relatively hidden.

THE "SKIN BRASSIERE"

Breast tissue is of soft consistency which conforms readily with the contour of the skin covering. Remodelling of the glandular component alone will not prove effective. A successful cosmetic result is mainly dependent on the provision of an adequate "skin brassiere." A good one must be made along certain lines to give suitable mechanical support. The paramount aim in the surgery

is to cut or make a firmer, normally-contoured skin brassiere (from that already present) with the consequent formation of a smaller, conic breast. In order to achieve this result we must, perforce, make not only a transverse (submammary), but a vertical skin excision from the areola down to a designated point on the submammary fold. While the method of curtailing the skin through a submammary excision and transferring the nipple to a higher position through a buttonhole has its appeal owing to its minimum and hidden scarring, the subsequent flat and squarish appearance of the breast is often disappointing from an esthetic point of view.

PLANNING

In planning mammaplastic operations there are two approaches: (1) The improvised and (2) the pre-operatively planned.

In the first, without specific presurgical mensuration, except reliance on experience, the breast tissue is exposed by incisions and standards of predilection; the size of breast tissue is reduced by visual means. The reconstructed gland is suspended at a site selected, also visually, or perhaps relative to certain anatomic landmarks and the skin is draped around the reconstructed breast, the excess being removed according to various methods.

The second approach consists of presurgical planning.

Here I intend to describe two such systems, namely: (1) Empiric-visual and (2) geometric. At the outset I would like to emphasize that the surgeon, in order to cope with unexpected situations must be thoroughly familiar with the various surgical approaches. The methods should rather complement each other than be relied on singly. With the most careful presurgical planning it may be discovered that the selected measurements prove impracticable.

VISUAL-EMPIRIC, PRE-SURGICAL PLANNING

The patient stands erect with arms relaxed. The new position of the nipple is selected visually.

The submammary fold serves as a landmark, because it changes little, if at all. The extent of the planned breast is gauged by visualizing it with the thumb held in the submammary fold and extending the fingers, fanwise, over the breast (Fig. 1).

The new level for the nipple is marked on the skin with a horizontal line.

Now the width of the breast is measured about one or one and a half inches above the planned nipple site. The width is bisected. The central point is connected with the actual nipple; this is the mammillary line. When the nipple is abnormally displaced from its central position the width of the breast is taken at different levels and the line connecting the half-marks represents the mammillary line. Where it bisects the planned nipple level will be the *new* nipple site. The mammillary line is also marked in relation to the submammary fold. It constitutes the submammary point (Fig. 2 SP).

Similar planning is carried out on the other breast. Even if one is higher than the other it is best to plan symmetric reconstruction.

The breast in its entirety is now pushed forcibly to one side and the sub-mammary point is connected by a straight line drawn to the new nipple site.

Fig 1 Manual estimation of new breast contour and nipple site
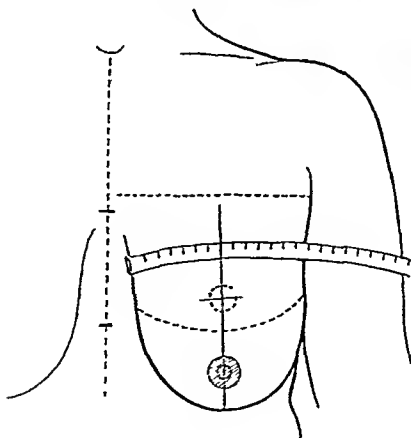
FIG. 2. Placing new nipple site; where mammillary line bisects new nipple level.

Then the breast is pressed in the opposite direction and a line is again marked between the new nipple site and the point in the submammary fold (Fig. 3). The two lines which commence at the new nipple site and meet at the sub-
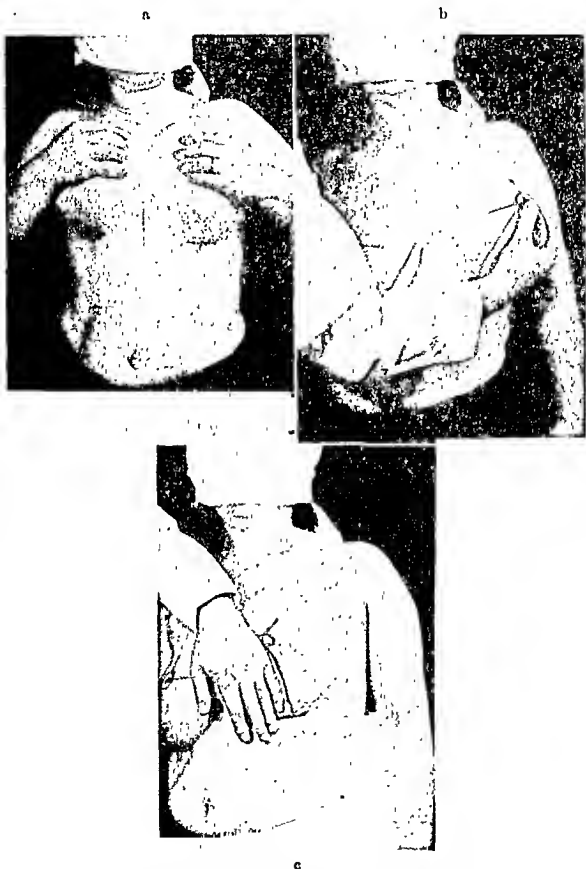
Fig. 3. (a, upper) Intersection of mammillary and submammary lines; (b, lower left) and (c, lower right) Connecting new nipple site with submammary points.

mammary designation include the vertical sector of skin which is to be removed (Fig. 4). It is evident that after the excision of the vertical segment the lower
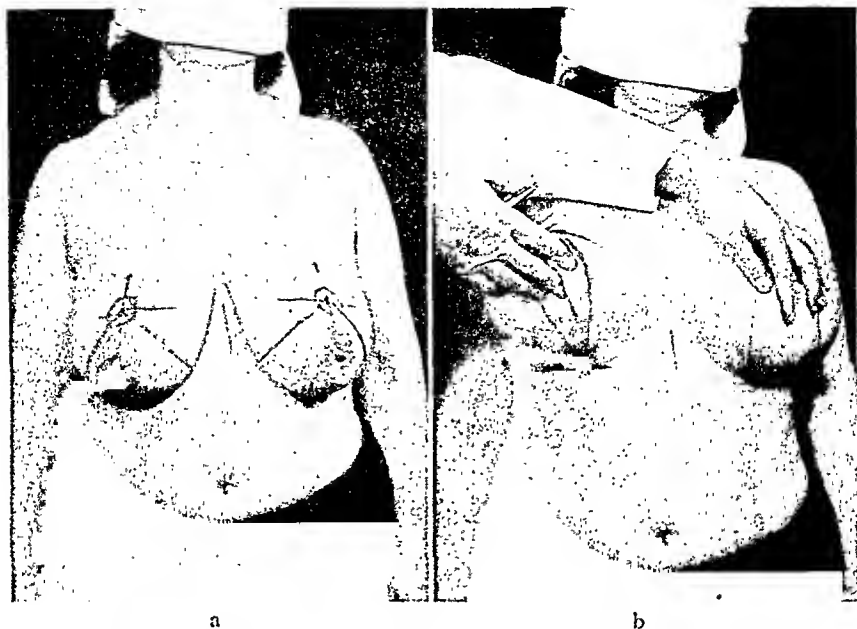
Fig. 4a and b. Delineation of vertical excision of excessive skin.
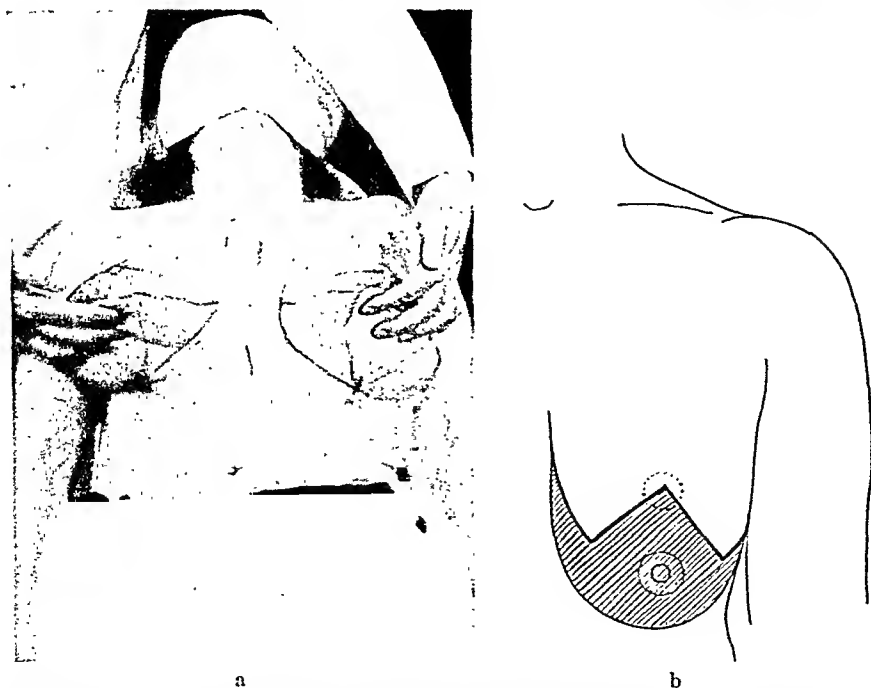
Fig. 5a and b. a. Delineation of transverse skin area to be removed. b. Retained skin flap for "skin brassiere" (unshaded). Excisable skin (shaded).

aspect of the breast remains larger than the upper one. In order to correct this redundancy, a transverse segment of skin must be removed from the lower part of the breast. The extent of skin to be excised is measured in the following manner: The planned distance from the new nipple site to the submammary fold (which usually ranges between two and one-half and three and one-quarter inches) is marked on the inverted V lines delimiting the vertical position. The area of skin extending below that required for the undersurface of the breast obviously is the excess in the transverse direction. This excess is delineated with a medial and lateral triangle (Fig. 5n and h). Care should be taken especially that the apex of the inner triangle does not extend beyond the sternal-lateral line in order to avoid conspicuous scarring after the operation. The markings are traced by superficial scratching with the point of a knife.
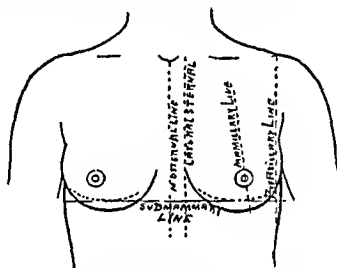
FIG. 6. Lines used in geometric planning for mammaplasty.

GEOMETRIC PLANNING

It occurred to me some years ago that it is possible and practical to plan the reconstruction of a pendulous breast to normal in size and contour on a geometric basis. The normal breast can be considered as a geometric body—a hemisphere or cone. As such it has its geometric components, namely, circumference, diameter, radii and axis. There are also definite anatomic and geometric criteria concerning a specific thorax and the location and size of a breast in conformity with it. On these considerations I have undertaken to develop a method of planning along geometric lines for reconstruction of a pendulous breast.

It is first necessary to draw a few orientation lines on the thoracic wall. A midsternal line is drawn from the jugular notch to a point below the submammary fold and then a lateral sternal line on each side along the insertion of the costal cartilages.

A pre-axillary line is placed corresponding with the anterior limit of the fold.

It is relevant to state here that while the normal breasts (which are firmly attached to the chest and divergent) are placed variably between the parasternal and axillary lines, for measuring purposes it is practical to utilize the sternal-lateral and pre-axillary lines. Both measurements are usually about the same.

The pendulous breasts, as a rule, in the erect position shift medially. This accounts partly for the fact that the sinus mammarium is more or less obliterated by pendulous, hypertrophic breasts.

The mammillary line is established in the manner already described in the empiric planning. All vertical lines are drawn with the patient in the erect position. The next line drawn connects the deepest points of the submammary folds. This marking is made with the patient in the recumbent position.
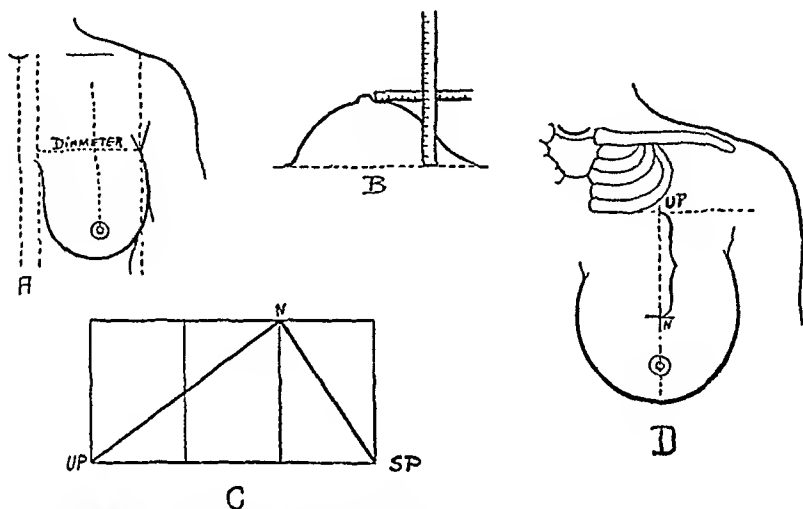
FIG. 7. (a) Transverse diameter between lateral-sternal, and pre-axillary lines.
(b) Measuring thickness of breast.
(c) Quadrangular pattern; long side equals diameter of normal breast, short side equals thickness of breast; UP-N-SP, breast silhouette; UP-N, upper aspect of breast (from lower border of third rib to nipple); N-SP, lower aspect (distance between nipple and submammary fold).
(d) Long diagonal of quadrangle (UP-N) measured on mammillary line from lower border of third rib, locating new nipple site.

SELECTION OF NEW NIPPLE SITE

The first consideration is the placement of the nipple. For this purpose the *diameter* of the normal breast for the specific thoracic conformation must be established on the following basis:

(1) The distance between the lateral-sternal and pre-axillary lines denotes the transverse diameter of the normal breast (Fig. 7c—a).

(2) The distance from the third intercostal space to the static submammary fold indicates the vertical diameter.

(3) The foregoing diameters, as a rule, are almost equal. If a noteworthy difference is found between them, the sums are added and divided by two to establish the mean.

(4) A similar procedure is carried out on the other breast. Again, if there is a great difference between the mean diameters of each breast, they are added and divided by two. The resultant sum is acceptable as the valid diameter for

each breast. In this manner due allowance is made for the contour and dimensions of the chest and its asymmetries.

(5) On the basis of normal dimensions, the vertical diameter is planned from the lower border of the third rib to the submammary fold.

When, however, the diameter measurement differs from the normal (as in the long, narrow or extremely wide and short thorax, for example) it must be projected from below upward; the lowest limit of this diameter begins at the submammary level and is first marked on the mid-sternal line. The upper limit of the diameter is carried transversely across the thorax.

(6) The thickness of the breast (the axis, in effect) is now measured (with the patient in a horizontal position) from the chest wall to the summit of the breast (Fig. 7c). The estimation is made by the use of two rulers; one placed horizontally at the summit of the breast and the other in rectangular relation to it and resting on the chest wall.

According to the measurements a quadrangle is drawn on a piece of paper. The long side represents the diameter; the short side is equal to the thickness of the breast. The quadrangle is (arbitrarily) divided into three equal parts (Fig. 7c). A diagonal is drawn through the first two-thirds (Fig. 7c—UP-N) and another in the opposite direction through the last third (Fig. 7c—N-SP). These diagonals represent the silhouette of the breast (Fig. 7c). Modification of breast contour can be made according to the patient's stature and preference to a certain extent, and the surgeon's objective.

(7) The long diagonal is projected on the mammillary line from the lower border of the third rib (or the calculated upper limit) downward (Fig. 7d—UP). The lower end will indicate the new nipple site (Fig. 7d—N).

GEOMETRIC PLANNING FOR THE "SKIN BRASSIERE"

With the aid of the diameter of the planned breast the circumference of the required skin flap can be established. For practical purposes it measures about three times the diameter. This estimation is derived according to the mathematical formula π, which denotes the ratio of the circumference of a circle to its diameter—3.141.

The requisite skin flap is fashioned from that available in the following manner. The width of the hypertrophic breast is measured and the value obtained is multiplied, as previously stated, by three. The circumference is measured on a circular flexible metal tape devised for the purpose (Fig. 8). The tape measure is so constructed that at one end—the zero mark—there is a slit where the other free end can be passed. The circle thus formed can be enlarged or decreased according to requirements. There are three movable markers on the tape measure.

The circular metal tape with the zero mark is placed on the upper limit of the diameter (usually at the third rib); the mid-marker on the opposite pole at the mammillary line; the instrument rests in this position and the amount of skin included is the tissue from which the new skin envelope or skin brassiere is fashioned. In order to ascertain the amount of skin needed the half-distance limits

of the circumference of the planned breast are marked on the large circle from
the zero point (Fig. 8c).

The circumference of available skin, for instance, is 45 centimeters. The re-
quired circumference is only 30 centimeters. The smaller amount is then divided
in half, measured from zero point, half to the right and half to the left. These
points are marked on the skin.

The new circumference designations are connected with the new nipple site.
These two lines form an inverted V of variable angle according to the size of
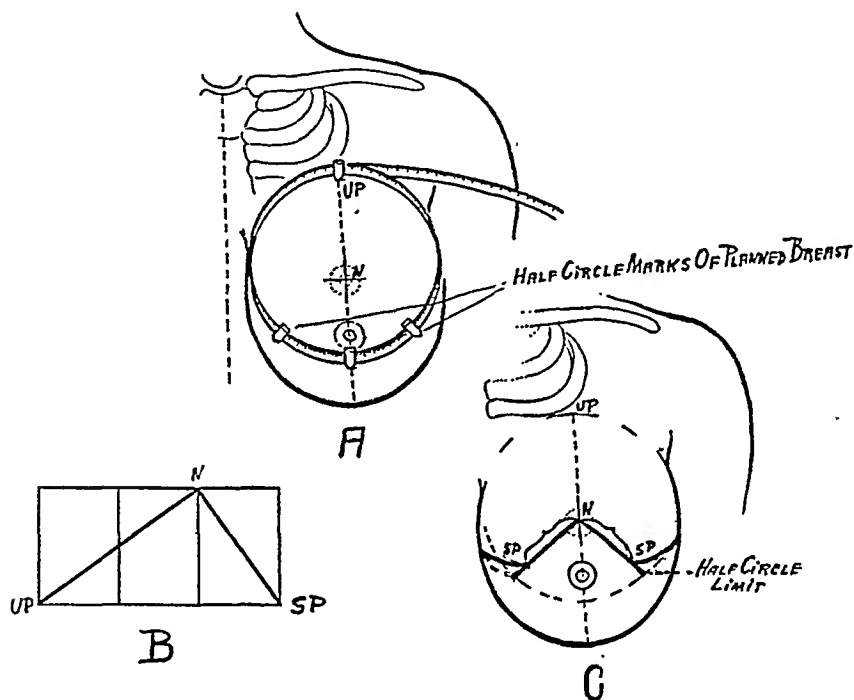
FIG. 8. (a) Circular metal tape in situ outlining available skin flap for reconstruction.
(b) Quadrangular pattern showing silhouette of breast.
(c) From available circular skin flap required one is fashioned by measuring on it the
circumference of the planned breast; N-SP, distance between nipple and submammary fold.

breast. Now the shorter diagonal of the quadrangle from the paper pattern is
measured on the line connecting the new nipple site with the half-circumference
mark (Fig. 8c). This line represents the distance from the nipple to the sub-
mammary fold—in effect the short side of a scalene cone. The redundant skin
of the lower aspect of the breast can be gauged by connecting the distal points
marking the short side with the corresponding ends of the submammary line.
These embrace two triangular areas (Fig. 9). Reference should be made here
to the fact that the distal limits of the original submammary fold may rest in a
lower position than the fold of the reconstructed breast. In order to overcome

this a correction is sometimes made elevating the ends of the new submammary fold to n position in conformity with the transformed breast. The extremities of the fold should lie within the sternal-lateral line on one side and, if possible, not beyond the mid-axillary line on the other side in order to avoid conspicuous scarring.

All mensuration can be attempted with the patient in the recumbent position; however, certain allowances must be made for the dimensions of the skin in the relaxed state. In this position mistakes are more likely to occur.

Now in regard to mensuration for reconstruction of the breast tissue proper. It is obvious that in reducing a hemisphere of tissue—a hypertrophic breast,
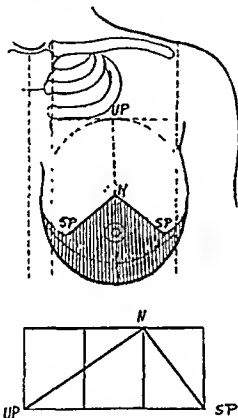
Fig. 9. Result of geometric measurement. Unshaded area between UP, SP, N, SP, flap for skin brassiere; shaded area, excisable skin.

for example—to smaller dimensions the main procedure must be to determine in advance the amount of tissue to be retained. To accomplish this it is necessary to make the following estimation. We know the actual diameter of the planned breast. This consists, however, of breast tissue plus skin covering. Allowance is made for thickness of skin (about 1 cm.) at each end of the diameter. The breast tissue diameter will therefore be minus 2 centimeters.

The designed breast diameter, for instance, measures 13 centimeters. Two centimeters are deducted for skin thickness. The diameter of the breast tissue proper is consequently 11 centimeters. On the basis of the known ratio of the π the circumference of the gland is about three times its diameter and in this instance 33 centimeters. This length is measured during operation on the periphery of the hypertrophied breast tissue either with n thin metal tape or

with a silk thread of desired length (Fig. 10a). The circumference measurement indicates the amount of breast tissue to be retained. The residual breast sector is removed. The site of excision is a matter of predilection on the part of the surgeon.

FIG. 10. (a) Tape measure indicates amount of breast tissue retained; (b) hemisphere reconstructed; (c, e) upper half of breast resected; (d, f) cut surface forms part of the hemisphere; base of cut surface anchored to pectoral fascia.

If the hypertrophy of the breast is of moderate degree it is usually sufficient to remove a wedge from the upper quadrants. If the enlargement is greater the excision may be from the upper and lateral quadrants, depending on the degree of hypertrophy. When there is extreme hypertrophy the entire upper half of the breast can be resected and even more when the deformity is of extraordinary

dimensions (Fig. 10c). In secondary operations excision is made ordinarily from the lower quadrants.

In the first two contingencies, whether a medium or small sector is removed, the hemisphere of the breast is reconstructed by closing the cut surfaces (Fig. 10 a and b). However, when about half or more of the circumference of breast tissue is removed it is usually found impossible to reconstruct the hemisphere by approximation of the cut edges without undue tension and the probability of necrosis owing to destruction of the blood supply. In this exigency, where the cut surfaces remain ununited, they form part of the circumference of the breast (Figs. 10c, d, e, and f).

Here a qualifying statement must be made. All the measurements for reconstruction of the breasts are taken on the principle that the diameters and radii of the sectors pass through the center of the hemisphere. Because the areola and a certain amount of contiguous tissue must be preserved, obviously, to retain viability, the excised sections are not from the actual center of the circle, but about 2.5 to 3 centimeters beyond it.
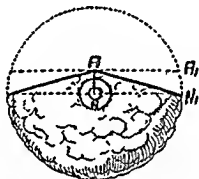
Fig. 11. Discrepancy between geometric planning and surgical excision; triangle included in A, N, N₁. A, A₁, N₁, represents projection of triangle of excessive tissue on periphery.

An excess of breast tissue will consequently remain beyond the geometric estimation (Fig. 11). The discrepancy is corrected in the following manner. Half of the excess of breast tissue is compensated for by removing an additional 1.5 centimeters from the periphery; to compensate for the other half the circumference of the planned skin brassiere must be made 1.5 centimeters longer.

Similar measuring principles are applied when the nipples are freely transplanted. The massive breast is then amputated—skin and breast tissue simultaneously—with an inverted "V" excision and the residual segments are united to reconstruct the breast. A skin disc atop the reconstructed breast is removed, leaving a subcutaneous fibrous base. The cut margins are united by inverted catgut sutures with the knots inwardly buried. It is evident that with this procedure the areola is grafted over the suture line.

THE OPERATION

With the patient in a horizontal position the chest is exposed from the clavicular region to the costal arches.

with a silk thread of desired length (Fig. 10a). The circumference measurement indicates the amount of breast tissue to be retained. The residual breast sector is removed. The site of excision is a matter of predilection on the part of the surgeon.

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Fig 12 Surgical results of combined Visual Imping and Geometric Planning

* Planning and operation of this case performed by plastic surgery resident

distorted. It may be restated that the residual crescentic subcutaneous fat on the skin flap provides the desired fullness at the upper margin of the breast.

If too large a part is left in the lower aspect of the breast a central sector there can be removed in a secondary operation.

It is pertinent here, incidentally, to state that necrosis is not always induced by cutting main vessels to the part, but by mishandling of tissues, strangulation with deep sutures, undue tension and torsion.

When the reconstructed breast tissue is affixed in its planned position trimming and re-draping of the skin brassiere is in order. First the areola is anchored in position with a silk suture to the upper limit of the vertical incision (previously mentioned cross-scratch marking). The removal of excess skin is carried out according to the original skin designation. As a control measure, before excision, the skin is temporarily approximated with a series of towel clips along the pre-operatively marked lines. Correction can be made if the designed skin cover is found too tight or loose. During the trimming at the lateral and medial ends of the submammary incision particular care should be taken that the adherent fat is removed down to the pectoral fascia lest little protuberances remain after the operation. The upper part of the vertical incision is closed for the time being with a running skin suture burying the nipple. The skin incisions are temporarily closed with inverted towel clips or a few silk sutures.

The operation is now carried out on the other breast up to this stage. The same procedure is accomplished on both breasts. The purpose of the temporary closure is to judge the symmetry and equal position of both nipple sites. They are measured with the long silk pendulum gauge, fixed at the sternal notch. Minor corrections can then be made. The placement of the nipple in its new position should not be atop the summit of the conic breast but slightly below. The eventual sagging of the breast carries the nipple to its normal position.

The areola site is now marked with the aforementioned circular die. After the skin disc is excised, the nipple emerges and is sutured in its new place. The surgeon and his assistant can now suture the wound edges simultaneously, thus reducing the operating time considerably.

The skin margins are united with interrupted fine black silk sutures. A few subcuticular white silk sutures may be used with the knots placed inwardly. At the submammary fold these can be anchored to the pectoral fascia, thus providing definite fixation and demarkation to the lower margin of the gland.

One drain is placed at the medial aspect of the breast and another laterally. The breasts are covered with abundant fluffed gauze and finally with a soft, adequately snug breast binder. No adhesive plaster is made to touch the skin. It may, however, be placed over the breast binder to assure correct immobilization.

SUMMARY

Two pre-surgical plans for mammaplastic operations are described—the visual empiric and the geometric.

The advantages of *pre-operative* planning are emphasized in contradistinction to the sole reliance on improvised visual methods.

The importance of providing an adequate skin brassiere in shaping the breast is emphasized.

Resection of breast tissue from any single aspect can be carried out owing to adequate vascularization from every direction. The surgery is based on principles used in forming a skin flap—particularly provision of a broad pedicle.

The advantages of the geometric planning are:

(1) Definite gauging of the contour and measurements of the breasts in relation to the specific thorax.

(2) Accuracy of measurements

(3) Clarity of directives, thus expediting the operation. (This is true in both geometric and empiric pre-operative planning.)

(4) Teaching value because it gives definite directions

(5) Ease of planning for different breast contours

(6) Availability of definite measurement records   These can be used when it is expedient to operate at different times on each breast

The judicious combination and utilization of these methods helps the surgeon to reconstruct pendulous breasts, hypertrophic or otherwise, to their normal contour, proportions and symmetry

INTERNAL WIRE-PIN IMMOBILIZATION OF JAW FRACTURES

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Varied methods of treating complicated and compound jaw fractures occur in the literature, and stem to a large extent from the World Wars. These methods include open bite splints, overhead plaster-cap traction devices, complicated dental appliances and external fixation. These might lead one to believe there is no uncomplicated solution to the problem. However, there is a direct ap

FIG. 1. Good immobilization obtainable by wiring the upper to the lower teeth, further stabilized by the addition of a twisted wire arch bar anchored to the lower teeth. reprinted from
Fractures of the Jaws and Related Bones of the Face
Key and Conwell's
Fractures, Dislocations and Sprains
Second Edition, 1937, C. V Mosby Co.
Chapter 12–235 J. B Brown

proach applicable to the problem of fractured jaw immobilization that can be resorted to in many instances, 1, 2, 3, 4. This method is one of internal wire fixation, detailed description of which will be outlined here. Whatever will give the best fixation is, of course, the ideal, and no one single procedure is applicable to all patients. Combined with the internal wire fixation may be dental arch supports, interdental wiring, direct bone wiring and, of course, dental fixation.
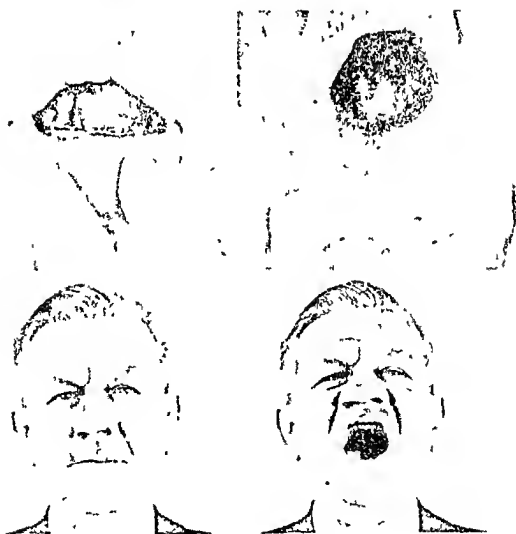
When enough teeth are present, in proper position for adequate immobilization, interdental wiring is still the method of choice. This involves, of course, the application of the lower jaw, reduced in correct occlusion, to the upper jaw and held solidly with No. 24 or 26 stainless steel wire between the teeth. To add further stability, an arch constructed of No. 24 wire looped around posterior teeth, then brought around and twisted together in front with anchors of No. 28 wire to the individual teeth, can be used. The variations of technique of interdental fixation are numerous and all are efficacious. These include con-

Fig. 3. Treatment of difficult fracture at angle without teeth to control posterior fragment, made simple and direct by internal wire driven through angle, across fracture site, into body of the jaw. Interdental wiring done because of associated fracture of the body of the mandible.
reprinted from

Internal Wire Fixation for Fractures of Jaw

by Drs. James Barrett Brown and Frank McDowell
Surgery, Gynecology and Obstetrics
Feb. 1, 1942, Vol. 74, 227–230

tinuous loop wiring, eyelet wiring, button wiring, elastic loop fixation and acrylic splinting, all of which have been adequately described.

When, for some reason, interdental wiring or other fixation would not be sufficient, the fractured lower jaw can be immobilized by a Kirschner wire, .05 to .08 inch, driven across the fracture site. Among the numerous indications for which this method has been frequently used are: lack of available teeth (Fig. 2); symphysis fractures; fractures at the angle with the posterior fragment displaced into the upper buccal fornix (Fig. 3); and when there is compounding into the mouth with infection and sloughing (Fig. 4).

The internal wire is not usually meant to completely surplant interdental wires, for every effort is made to immobilize the fracture in all planes. A wire dental arch is used to give fixation in another plane preventing rotation, pulling apart, and to further jam the fragments together as in Fig. 2.
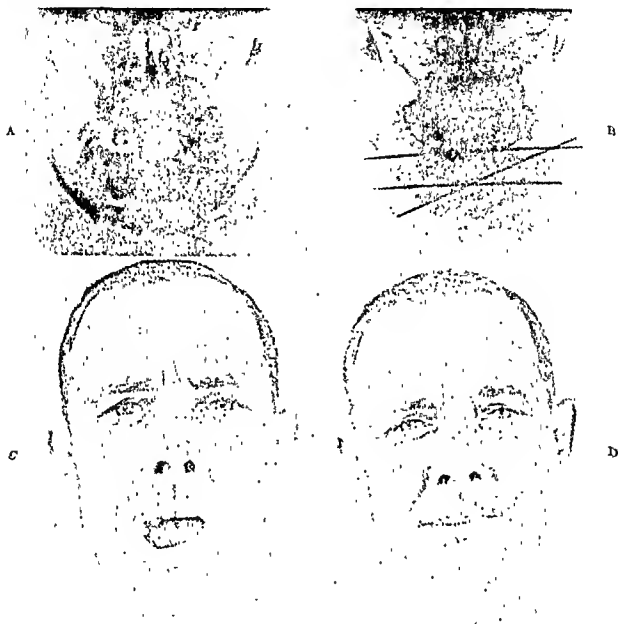
Fig. 4. *A* ... jaw
which felt lik ... isted
steel wire ar ... ated
usable teeth demanded the direct method
wires at eight week's time with normally

Where there are no teeth in position for one or more interdental wires, as in Fig. 3, reliance often can be placed on one or two internal wires for satisfactory steadiness, after reduction has been done.

All methods of simple, direct, fixation were necessary in Fig. 4, where in spite

FIG. 5. "Pipe-stem" sized, edentulous lower jaw held steadily with the fracture in the body stabilized by circumferential wires around dentures and that at the angle immobilized by an internal wire, avoiding opening reduction. Healed solidly at eight weeks.

of old dirty wounds with sloughing, and multiple fractures with loose teeth the alignment was held until the jaw was solid in eight weeks.

In an edentulous mouth, internal wires can also be used in conjunction with circumferential wires around the patient's dentures, as shown in Fig. 5.

The technique of introduction of the internal wire has changed little since first reported (1, 2). Under as good as possible asepsis the wire is driven across the fracture site with a power drill, while the fragments are held in reduction by another person. If usable teeth are present, this holding can be facilitated by reduction of the fracture, and then immobilizing it, by interdental wiring, or even if not too securely, by the application of an anterior dental arch of twisted steel wire. Usually a better "line can be drawn" on the correct way to drive the wire through the fragments by holding the jaw between the fingers of one hand, and the power drill in the other. Substitution of a hand drill for a power drill is not satisfactory because the necessary speed for penetration of the bone is not developed in a hand drill. The speed of rotation of the power drill should be fast enough for penetration, but not fast enough to produce necrosis of the bone.

With the wire, cut to the minimal length, to prevent "whipping" of the wire when rotating within the chuck of the power drill, the three-sided sharpened point is placed firmly on the bone through a nick in the skin and denuded periosteum. It is driven across the fracture below the nerve canal, on through the cortex on the other side, or left in the bone if it appears solid enough.

A fixation pressure dressing of mechanics waste is a further support to the broken jaw and helps prevent hematomas and swelling of the soft tissues, thus decreasing chance of infection and adding to the patient's comfort.

Complications following the use of the internal wire have been slight, confined for the most part to slight drainage around the wires.

Internal wiring necessarily requires reduction of the fracture and establishment of the desired alignment of the bone and teeth. Where reduction is to be accomplished in stages, or gradually with rubber traction, the internal pin is not put in until this is accomplished. If the means already used in reducing the fracture is satisfactory for holding the fixation then the pinning need not be used.

Internal wiring is a simple, direct method of treatment in patients with low grade osteomyelitis or even gross infection, in fractures with a chance of faulty union or non-union, as at the symphysis. It may be used when usable teeth are not available, for example in fractures at the angle, or when interdental wiring is contraindicated or undesirable.

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IMMEDIATE RECONSTRUCTION OF THE LOWER JAW FOLLOWING SURGICAL EXCISION OF LARGE TUMORS

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AND

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The surgical treatment of large tumors of the lower jaw often requires the resection of half the bone, and this determines severe deformity, marked depression of the region involved and unbalance of the muscle-pull on the opposite side, causing deviation of the remaining fragment—specially noticeable on opening the mouth—seriously interfering with mastication.

The correction of these defects has been attempted by prosthetic appliances and by surgical procedures. For the sake of brevity we do not wish to enter into the description of well known surgical techniques for the restoration of facial contour and function of the jaw. Suffice it to say that even if good results have been attained, they never were completely satisfactory regarding the functional part of the repair, as the patients were seldom free from having to use some sort of dental appliance to overcome the lack of muscle action on the reconstructed side.

Modern authors advocate the use of bone grafting procedures to reconstruct the missing jaw, but any surgeon attempting this in a later operation is prone to find serious difficulties in preparing the bed for the graft. Experience taught us that the scar tissue found in the place of the former jaw was often hard to dissect. In trying to form a large bed, there was always the danger of lesion of important neighboring structures. This was specially true in the vicinity of the ascending ramus, where the fear of severing branches of the 7th nerve limited the reconstruction to a very short length. Besides, the muscles were no longer available, as extensive retraction made their reattachment to identical insertions on the new jaw impossible; therefore the reconstructed jaw lacked their action, resulting that, even though the bone repair was successful, the jaw was in an abnormal position, and defective function resulted from the unbalanced muscle-pull. In edentulous patients the results were even worse, as the sliding appliance used to check the lateral movement could not be utilized, with severe impediment to mastication.

We soon became aware of the convenience resulting from early reconstruction of the jaw, which obviated the retraction and abnormal fixation of the soft tissues For that reason we reduced the interval between the excision of the tumor and the reconstructive procedure. In recent cases this was performed within fifteen days of the first operation with satisfactory esthetic results. Figures 1 and 2 show

a good example of early reconstruction of the jaw with cancellous bone chips carried out within two weeks of the resection of the left half of the maxilla, for a suppurating cystic adamantinoma. The bone structure obtained is solid, and acts very well as support for a denture. Notwithstanding, there is a noticeable deviation which has to be checked by a simple internal appliance on the right side.

There was just one further step necessary to reach our objective. This was accomplished by performing the reconstruction of the jaw immediately after the

FIG. 1   FIG 2

FIG. 1. X-ray findings one year after reconstruction of the left jaw with cancellous bone chips. The whole half of the jaw was removed following invasion by suppurating cystic adamantinoma. Notice the limited extent of the reconstruction of the ascending ramus.
FIG. 2. Showing the esthetic results of the reconstruction. The patient wears permanently a dental appliance to overcome the tendency of the jaw to deviate to the right side.

extirpation of the tumor. Basically, the operation was made possible by following four principles:

1) By simultaneous working of two teams: the one engaged in removing the tumor, and the other in obtaining the bone graft and reconstructing the jaw.

2) By handling the soft tissues with the utmost care, so as to preserve their vitality as far as possible.

3) By careful immobilization of the region during the postoperative period.

4) By extensive use of antibiotics (local sulfonamide and parenteral penicillin).

Owing to the successful grafting in former restorations of the jaw, it was decided to use cancellous bone chips in the immediate reconstruction also. We believe that this is the only material which can be easily shaped and adapted to the irregular surfaces characteristic of these tumor beds. Besides, cancellous
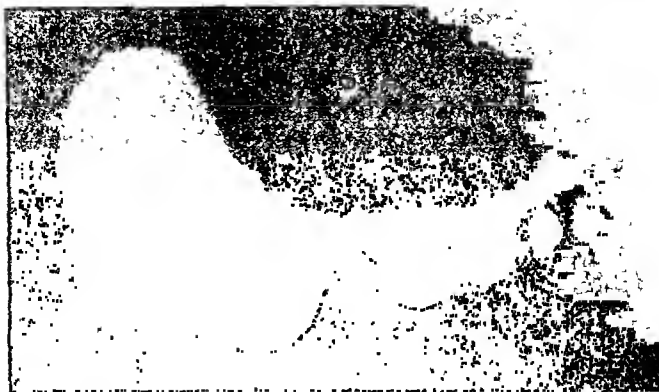
FIG. 3. The acrylic splint used to maintain the shape of the graft
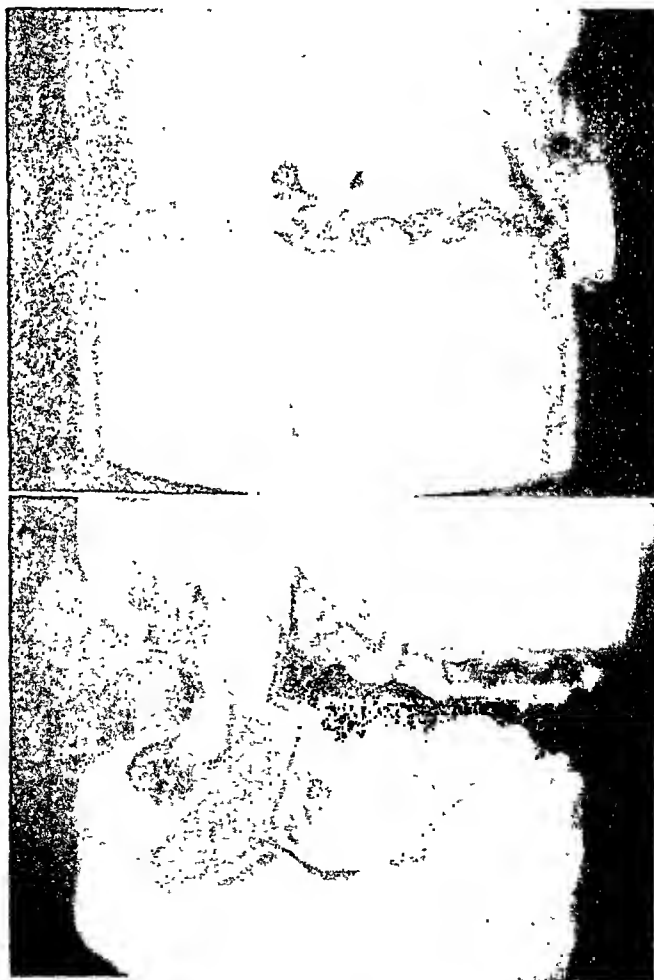
FIG. 3 BIS. The sliding appliance which checks the lateral displacement of the jaw during the period of consolidation.

bone has a great resistance to infection, an important factor in view of the highly infected condition of the wound, resulting from an infected tumor and the communication with the buccal cavity. Only living cancellous bone chips could endure such contamination and build up a healthy and strong mass of bone.

This operation requires the collaboration of an odontologist, who makes the impressions of the jaws so as to prepare the necessary oral appliances. One of these is required for shaping the bone graft and consists of an acrylic splint held in place by a metallic bar attached to the remaining teeth. The other appliance is a sliding check intended to limit the lateral displacement during the period of consolidation, and is attached to dental crowns cemented beforehand to the teeth (fig. 3).

The patient has to be carefully prepared for the operation as it involves an extensive trauma which might imply a large loss of blood. The cases must be
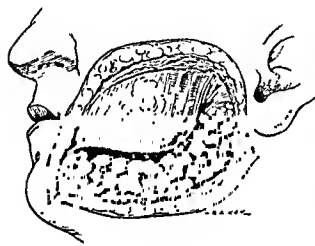
Fig. 4   Fig. 5
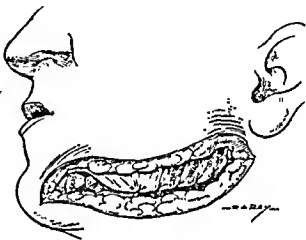
Fig. . . . . bed of the former jaw imitating . . . . der the lower border of the bone graft, so as to bring them to the proper relationship with the new jaw.

selected so as to ensure a good closure of the wound, discarding those in which there are lesions of the skin, such as radiodermatitis, discharging fistulae or tumor invasion. Perfect wound closure is one of the keys to successful bone grafting, therefore tissue vitality is of supreme importance.

The operation may be performed either under general anesthesia or by nerve block and local procaine-adrenaline infiltration. The procaine-adrenaline solution is used even in the former case, to reduce hemorrhage. The technique is very simple; the resection of the tumor is performed following the usual methods, making as large an opening of the buccal cavity as may be necessary. Meanwhile, the reconstructive team obtains a sufficient quantity of cancellous bone chips from the opposite iliac bone, taking special precautions so as to avoid infection. The chips are prepared in suitable sizes, and the wound closed.

Once the resection of the maxilla is completed the gap in the oral mucosa is closed with running sutures of catgut. Hemostasis is secured and the distal stump of the jaw is prepared to receive the grafts, cutting a step-like recess with

FIG. 6
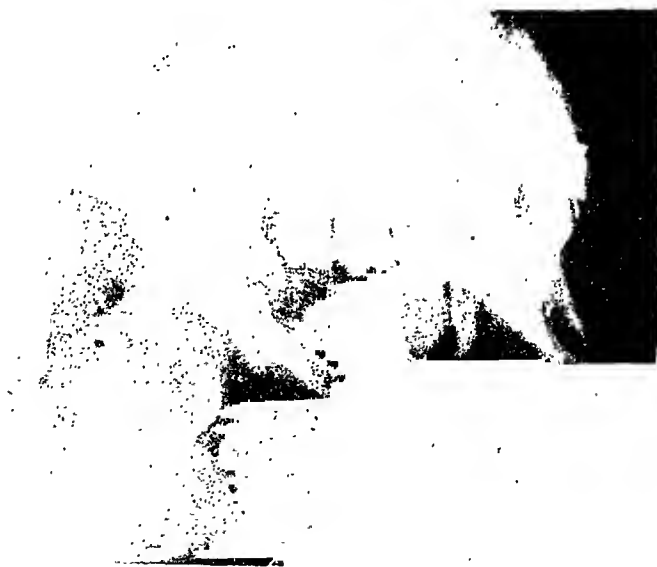
FIG. 6 BIS

FIG. 6. AND 6 BIS. Pre and postoperative X-ray films of large cystic adamantinoma of left jaw. The reconstruction of the jaw followed immediately the resection of the tumor.

a strong rongeur.   The cancellous chips are then laid in the bed of the resected bone and tumor, trying to imitate the general shape of the original structure

(fig. 4). This does not need to be exactly done, as cancellous bone has a tendency to fill in the gaps between the chips, rebuilding, in time, a jaw of almost normal aspect. Anyway, the final shaping is done by the oral splint, which follows more or less the smooth contour of the region.

Now we come to the reinsertion of the masticatory muscles, about the new jaw, which is facilitated owing to these muscles always being distended and tapered according to the size of the growth. Therefore they lack contracting power to pull and deform the graft, and their extra length lends itself to reinsertion, by simply suturing the soft tissues around the chips of bone. The larger the tumor, the better are the chances of accomplishing this step satisfactorily.

Fig. 7. Aesthetic and functional results are good after one year. The patient wears a denture on the reconstructed side. No other dental appliances are used.

This is carried out by suturing together the fibers of the masseter and the internal pterygoid under the lower border of the bone graft, forming a sort of sling (fig. 5). The muscular reattachment is completed by suturing the remaining tissues, and then closing the wound in the usual way. Two or three small rubber drainages can be left if desired, and removed a few days later.

The acrylic splint is then put in place and immediately built up with stent compound if this is required to improve the features. The final shaping is obtained by means of a light plaster cast, laid directly on a thin gauze dressing, and carefully molded during the setting period so as to eliminate any dead spaces. This cast is tightly held in place by a good pressure bandage. Once narcosis is suppressed the incisors of both jaws are wired together, to insure a perfect immobilization.

If it is felt that the amount of tissue involved by the tumor will impair the results if the whole procedure is carried out in one operation, it is preferable to divide it into two stages.   In the first the cancellous bone chips are prepared and kept in a sterile jar in a refrigerator, to await further use.   Once the patient has recovered, three or five days later, the extirpation of the tumor is undertaken and the reconstruction of the jaw is accomplished as indicated.   In this way the handicap of a lengthy operation is overcome and success secured by the excellent vitality of the preserved bone cells.

Fig. 8

The postoperative period has so far been quite uneventful in our cases.   Large doses of penicillin were given systemically during a week, more or less.

The cleansing of the mouth must be properly looked after.   The patient is kept on fluid diet during the period of complete immobilization of the jaw, which is prolonged during forty days.   After twenty days the external cast may be discarded and a firm mass of bone felt under the skin, conforming to the shape of the jaw.   This new bone has not been radiographed as calcification begins at a later period, but the impression is that the chips have already soldered together by the growth of new tissues.

Fig 8 bis

f.....coma of the right jaw   The re
ction was
the bone

Fig 9 AND 9 BIS Actual results of the operation   The new jaw is solid and there is
no lateral deviation   In the last month there has been a painful resection of the tissues
about the distal end of the graft   A biopsy was performed showing a recurrence of the
tumor, which will be treated by irradiation

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On the 50th day movement was allowed by releasing the teeth, and the patient could be put on a soft diet. The lateral displacement was checked by the sliding appliance, already secured to the teeth before the operation. As for the oral splint, it was still retained as the groove in its undersurface may still help to mould a sort of alveolar ridge, which will be very useful to hold a future denture.

The patients experience very little discomfort during the period of consolidation, which is completed in about 60 days. Afterwards the splint and the sliding check can be discarded and a definitive denture put in place. The masticatory muscles work on both sides in normal conditions so that there is no lateral deviation whatsoever, securing good function of the jaw. The only remaining evidence of the operation will be a more or less conspicuous scar and a depression in the region of the angle of the jaw. The depression is due to the fact that the oral splint cannot be made to push against the mucosa so as to shape the maxillary angle, as this would produce pressure lesions. Therefore we prefer to undertake the correction of the defect in a later operation. In due time the new jaw loses a good deal of its former size, resembling a normal jaw in every respect.

This procedure has been carried out in two patients, whose clinical documents are shown in figs. 6 to 9, and the esthetic and functional results have been quite satisfactory. The only complications observed were: the first patient eliminated a small piece of bone during the postoperative period, and the second has developed a recurrence, which is treated with X-rays.

COMMENT

The immediate reconstruction of the jaw with cancellous bone chips has fulfil our objective, providing good support to the tissues of the face and a complete restoration of the function. However, there is one serious objection to this procedure: the possibility of recurrence of the tumor. We have had to deal with such an event, but anyway we do not feel justified in depriving the patient of the advantages of immediate reconstruction. We firmly believe that the restoration of facial contour and the normal function of the jaw more than outweigh the danger of a recurrence that can be easily diagnosed by proper follow-up and receive similar treatment.

TRANSFER OF A METACARPAL, WITH OR WITHOUT ITS DIGIT, FOR IMPROVING THE FUNCTION OF THE CRIPPLED HAND*

LIEUTENANT COLONEL GILBERT L. HYROOP, M.C., A.U.S.

Metacarpal transfer, as used in this paper, implied the transfer of a metacarpal with or without the attached digit, its tendons, nerves and vascular supply.

A search of the literature reveals very few metacarpal transfers with attached digits recorded, and apparently their usefulness has not been stressed in the past. The first transfer of a metacarpal with the attached digit was reported by Dr. Bunnell in 1931. This was a transfer of a second metacarpal with partial amputation of the index finger. However, some of these surgical procedures were carried out in the Plastic and Hand Surgery Centres of the Army during and following the late war, by Graham, Slocum, Frackelton, Musselman and others, at the suggestion of Dr. Bunnell, in his capacity as a Civilian Coasultant.

The aim in any type of reconstructive surgery is to restore or improve function, sensation and cosmetic appearance. Therefore one endeavors to perform reconstructive surgery with a minimum of operative procedures, that is, if a part can be restored merely with the use of soft tissue, there would be no need for radical surgery. In the case of metacarpal transfer, no entirely satisfactory alternative method has been found.

In many more or less hazardous occupations, or where maximum efficiency is required from the worker, a man with a severe disability of the hand will not be employed. Loss of the thumb, for example, with the first metacarpal, produces a tremendous disability of the hand. The individual has a loss of many important functions of the hand, such as pinch and grasp, and is unable to carry out any of the finer movements necessary for normal dexterity. Thus he is prevented from performing most of the important functions of the hand. In many instances, the patient is not aware of the amount of disability he has, and awkwardly carries out a few limited motions. Amputation of the long finger with the head of the third metacarpal produces a weakened hand with malpointing of the index and ring fingers. When making a fist, these fingers sometimes cross, and when working around machinery, these crippled hands become hazardous.

BASIC CONSIDERATIONS

There are only a few short cuts to be found in reconstructive surgery of the hand. The surgery is difficult and time consuming, requiring the utmost precision work from the surgeon. Once the tourniquet is applied to the arm, the planned surgical procedures must be carried out carefully and as rapidly as possible, with the least waste of motion and effort. Intelligent handling of

tissues pays dividends in end results. The best time saver is a detailed plan of surgical procedure, followed exactly. To this end, a complete examination, diagnosis and plan of surgical procedure should be made. The following is an outline of an examination made on the cases discussed in this paper.

1. General physical examination.

2. X-rays of the hand and entire extremity, if necessary.

3. Neurological examination of the peripheral nerves, with the findings indicated in colors on a drawing.

4. Photographs showing the deformities of the arm, forearm and hand.

5. Joint motions measured and recorded.

6. After careful analysis of the above, with the patient present, a drawing of the hand is sketched, listing the size and exact location of the cicatrices and other pathology. The surgical procedures to be carried out are then listed. The more cooperative and intelligent the patient, the better the end results.

In some instances, plastic, neurologic, orthopedic and vascular work may be carried out at one sitting. This is particularly true in many metacarpal transplants, and metacarpal transplants with adjoining digit.

ANATOMY AND PHYSIOLOGY OF THE HAND

The anatomy of the upper extremity will not be discussed in detail. However, it is necessary, for the purpose of this paper, to recapitulate a few important points. The thumb is considered the lateral part of the hand. The metacarpals, beginning with the thumb, will be designated one to five. The thumb has a proximal and a distal joint. The other digits, namely the index, long, ring and little fingers, have proximal middle and distal joints. The tip of a normally pointing digit when flexed individually, converges to the tubercle of the navicular bone, except in the case of the thumb.

The normal position of the metacarpals should be kept in mind. Of course, in metacarpal transfer, special consideration must be given to the exact location of all muscles, tendons, nerves, blood vessels and ligaments.

The normal pointing of the digits should be carefully considered. Even though particular attention is given to this, and to the alignment of the transferred digit, it will be found that, after amputation of the long finger, the two remaining parallel digits do not always align perfectly. For example, the medial aspect of the index finger usually conforms to the lateral aspect of the long finger, but when the long finger is missing, the index finger will not conform to the lateral surface of the ring finger in an exact manner.

The skin creases and Langer's lines must be always kept in mind when making incisions, and, of course, are to be avoided. However, in some instances, in transferring metacarpals, incisions must be made across flexor creases in the palm, and this can be done in such a way as to avoid flexor contractures.

SPECIAL CONSIDERATION OF THE THUMB

The thumb is the most important digit of the hand, and its loss leaves the hand severely crippled. Some substitute is necessary for a functioning hand, and there are four methods of replacement:

1. A prosthesis.
2. A tube pedicle with a bone graft.
3. Transfer of a digit from the opposite hand, or toes.
4. Transfer of a metacarpal, or metacarpal with the attached digit.

The fourth method is, in the author's opinion, by far the most satisfactory. The prosthesis is usually placed on a shelf and forgotten. The tube pedicle method is time consuming, requires several operations, and the end result is a thumb that is somewhat delicate and has inferior sensation. Many of our patients have come to us with a history of losing a thumb constructed from a tube pedicle with a bone graft, as a result of infection following trauma, or because of use before sensation was established. Others required many operations due to postoperative complications.

<div align="center">INDICATIONS FOR TRANSFER OPERATIONS</div>

<div align="center">Thumb</div>

a. Loss of the thumb with the distal two-thirds of the first metacarpal

Here the index finger and the distal half or less of the second metacarpal may be transferred by an osteotomy or bone graft to the first metacarpal. In this instance, the end result should be nearly normal motion, depending upon the condition of the carpo-metacarpal joint and the muscles and tendons present after amputation of the thumb. Shortening of the index finger improves the function of the new digit (Plate I, Figs. A and B).

b. Loss of the thumb with the entire first metacarpal

A normal or damaged index finger may be transferred, with its metacarpal, to take over the function of the thumb. The motion of the transplanted metacarpal at the carpo-metacarpal joint would be only slight, depending on the amount of motion found in the greater multangular bone. The digit would flex and extend, and if the intrinsics were present in the finger, there could be abduction and adduction. This would require the preservation of the ulnar nerve. Some abduction may be added by a modified loop operation, and adduction may be obtained by transfer of a spare tendon (Plate I, Figs. C and D).

c. Loss of the thumb with the first metacarpal and amputation of the index finger at the proximal joint

The second metacarpal may be transferred with palmar skin nerves, tendons and blood vessels, for a thumb post. In this case, the metacarpal must be exactly located where the remaining digits will oppose it, for the functions of pinch and grasp, and still have finger clearance so that a fist can be made.

d. Loss of the thumb and index finger with their metacarpals

The long finger, whether it is damaged or not, may be transferred, with the third metacarpal, to the site of the amputated thumb (Case I, also Plate I, Figs. E and F).
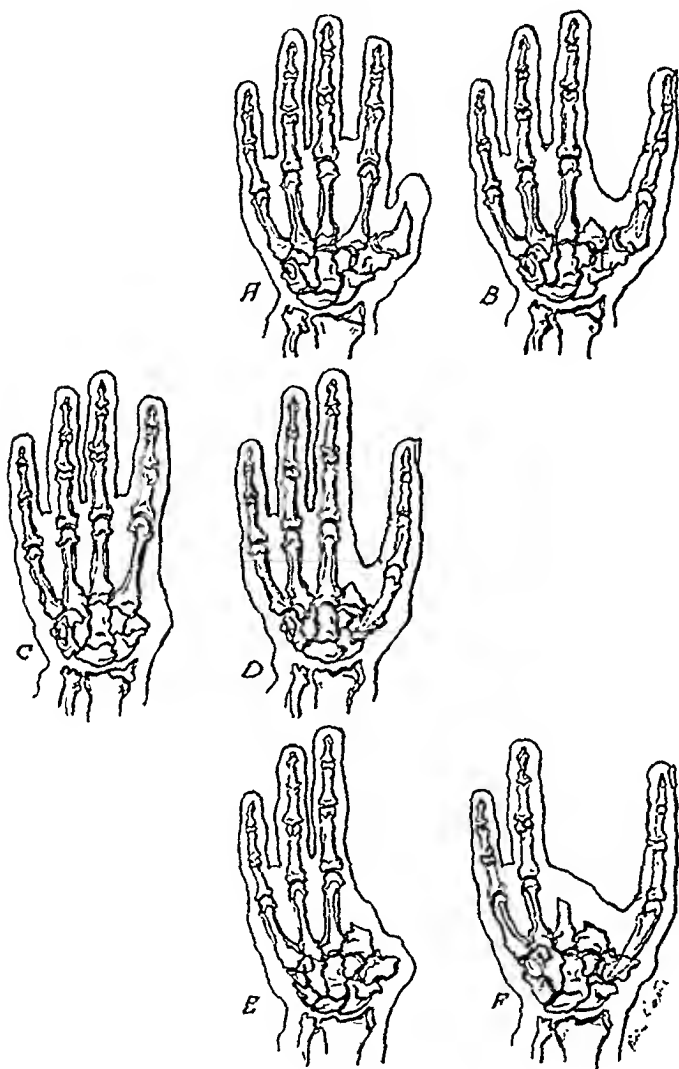
PLATE I

FIG. A. Amputation of the thumb with the distal two-thirds of the first metacarpal.
FIG. B. Transfer of index finger with distal one-third of second metacarpal to the first metacarpal.
FIG. C. Amputation of the thumb with first metacarpl.
FIG. D. Transfer of the index finger with distal one-half of second metacarpal to the greater multangular carpus.
FIG. E. Amputation of the thumb and index finger with first and second metacarpals.
FIG. F. Transfer of the long finger with distal one-half of the third metacarpal into the greater multangular bone.

e. Loss of the thumb and index finger with their metacarpals and amputation of the long finger at the proximal joint

The third metacarpal may be transferred to the site of the thumb, along with palmar tissue, nerve and blood supply.

CASE I. T P.

Fig. 1a. Hand before surgery showing amputation of thumb and index finger. Rotary angulatory osteotomy was performed on the third metacarpal elsewhere The patient is unable to grasp or pinch.

Fig. 1b. X-rays before surgery showing angulatory osteotomy of third metacarpal

Fig. 1c. Post-operative X-ray, long finger, with third metacarpal transferred and inserted into the greater multangular bone, with bone graft. Chips of iliac bone have been placed near base. Kirschner wires are used for immobilization.

Fig. 1d. Kirschner wires have been removed

Fig. 1e. Hand, post operative.

Fig. 1f. Shows hand grasping a glass. Patient can also grasp handle of a gavel or hammer.

In the author's experience, the results of the above mentioned procedures have proved superior to a thumb lengthened or constructed from a tube pedicle

with a bone graft, because the palmar tissue has some of the specialized nerve endings and is particularly adapted to usage and to withstand trauma.   Tube pedicles with bone grafts, nevertheless, have a very definite place in reconstructive surgery of the hand.

Index Finger

When the index finger is amputated at the proximal joint, or with the head of the second metacarpal, no transfer is indicated, but if the stump is painful, disfiguring, or if the function of the hand is interfered with, the metacarpal may be severed obliquely near its base.   This will leave the extensor carpi radialis longus insertion intact, thus preserving the strength of the wrist.   However, as stated above, if the thumb is amputated, the second metacarpal may be used for construction of a thumb.

Long Finger

Loss of the long finger with the head of the third metacarpal is usually an indication for metacarpal transfer because there is destruction of the metacarpal arch, malpointing with rotation, of the index and ring fingertips, with weakness of the hand in grasping.   The fingers may or may not cross when a fist is made, depending on the pathology present.   Small objects, such as coins, may slip out of the patient's hand.

In the Plastic and Hand Centres of the Army, when we first started repair of this type of deformity, an operation was carried out which consisted in skidding the fourth and fifth metacarpals laterally, so that the ring finger would take over the function of the long finger.   This was done by the author in a couple of cases and the results were satisfactory, but it was obvious that it was applicable to only a few cases.   If the bases of the metacarpals did not fit the carpal articulations, this produced malpointing of the fingertips.   Orthodesis, carried out to overcome this, if incomplete, may produce a painful hand at a later date.   Complete fusion of these carpometacarpal joints prevents cupping of the hand, and also palmar flexion of the heads of the fourth and fifth metacarpals.   For example, when one makes a fist, with a normal hand, the second and third metacarpal heads are fairly well stabilized, while the fourth and fifth are slightly rotated and flexed toward the palm.   In many injuries, such as malunion of the second and fourth metacarpals, alone or with other injuries, this operation proved impractical in most cases.

Transfer of the index finger with the second metacarpal to the base of the third metacarpal, with or without bone graft, has proved satisfactory in most instances (Case II).   If there is loss of the entire third metacarpal, a large bone graft is inserted between the proximal ends of the second and fourth metacarpals, its base resting on the capitate bone, then the second metacarpal is transferred into the bone graft (Case III), or the second metacarpal may be transferred, with a bone graft, to the capitate bone.

If the function of the long finger is seriously impaired, due to malunion of the third metacarpal, along with destruction of the skin, vascular supply, nerves

and tendons, with ankylosis of the small joints, amputation of the finger, with the distal two-thirds of the third metacarpal, may be carried out, and the index
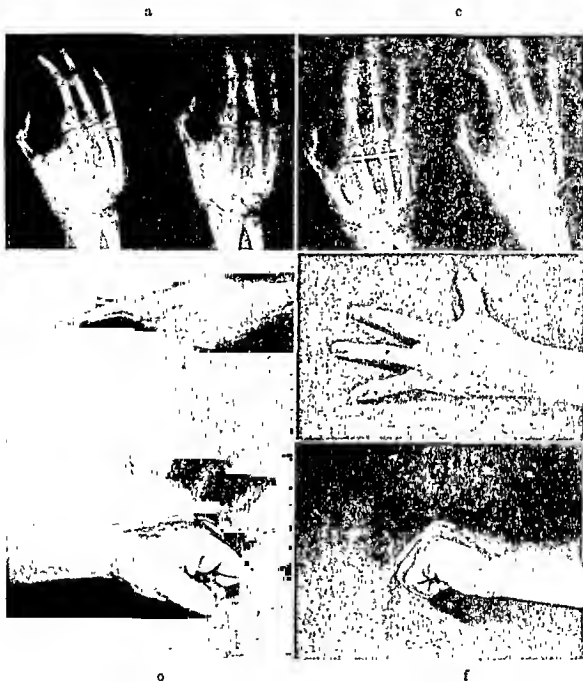
CASE II. L. C.

FIG. 2a and b. Shows X-rays before surgery.
FIG. 2c. Osteotomies at bases of metacarpals and transfer of second metacarpal to third metacarpal base.
FIG. 2d, e, f, and g. End result after transfer of index finger. Patient has nearly normal range of motion.
FIG. 2d. Shows that intrinsics are functioning.

finger transferred, with the second metacarpal, to the third metacarpal (Case IV).

Ring Finger

Loss of the ring finger, with the head of the fourth metacarpal, may be handled by transferring the little finger, with the distal two-thirds of the fifth metacarpal,

to the base of the fourth metacarpal. The deformity produced in these cases is damage to the metacarpal arch, with rotation and malpointing of the little and long finger tips, and sometimes crossing of these digits when making a fist, depending on the pathology present. There is always weakness and a diminution of function of the hand.

As in the case of the long finger, where there is damage to most of the finger, where repair would involve a series of operations, with only a poorly functioning finger as a probable end result, amputation of the ring finger with part of the fourth metacarpal may be carried out. The little finger, with the fifth metacarpal, is transferred to the fourth metacarpal site, to take over the function of the ring finger (Case V). This is a time saver and gives superior function to the hand as well as improved cosmetic appearance.

a   b

CASE III. R. L.

FIG. 3a. X-ray before operation, showing loss of long finger with the entire third metacarpal.

FIG. 3b. X-rays post-operative, showing iliac graft inserted between second and fourth metacarpals, and the second metacarpal amputated obliquely at its base and inserted into the bone graft.

Where there is amputation of the ring finger with the head of the fourth metacarpal, and also amputation of the little finger at the proximal joint, moving the fifth metacarpal to the fourth metacarpal area will sometimes improve the malpointing of the long finger, as well as improve the strength and cosmetic appearance of the hand.

Little Finger

Amputation of the little finger at the proximal joint. In this instance the metacarpal may be resected obliquely if the stump is painful or if it is hazardous by reason of the patient's occupation.

PREOPERATIVE CONSIDERATIONS

Under special circumstances, it may be well to repair the skin, nerves, bones and tendons before the metacarpal is transplanted, to determine the sensation and the amount of function that is to be expected in the digit. For instance,

a   b

c   d

e   f
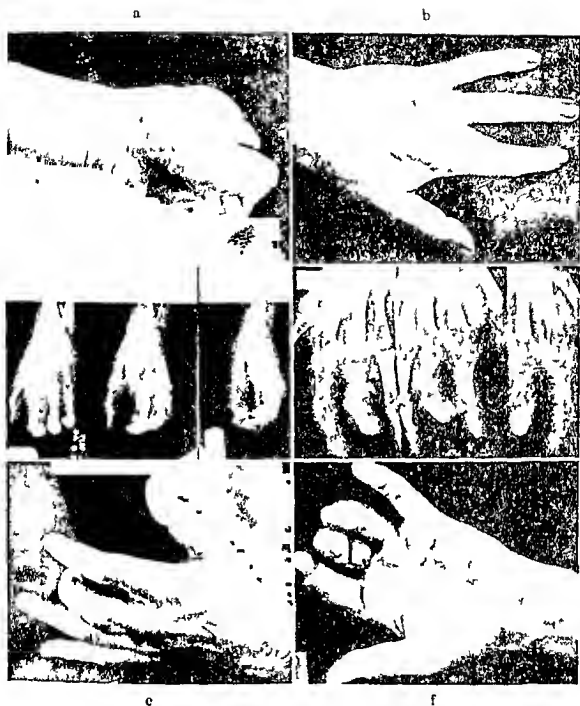
CASE IV   C H

FIG 4a Hand before operation showing flexor contracture and cicatrices over the volar aspect of the long fingers and in the cleft between the long and ring fingers There is atrophy of t¹ ᶜ ᶜ ᶜ ᶜ ᶜ

FIG 4b   index finger and lateral

FIG 4c

FIG 4d   ansferred to base of third metacarpal with bone graft

FIG 4e Dorsal view of hand post-operatively Long finger was filleted and the skin on the lateral aspect of the long finger was used for coverage on the medial aspect of the index finger, over the first phalanx

if there is destruction of the pulleys, and the tendon that flexes the finger to be transferred produces malpointing this should be noted before surgery and corrected with a pulley operation, before the metacarpal with its digit is trans

planted. In some instances, orthodesis of the phalanges, capsulotomies, or repair of tendons and nerves are carried out at the same time the finger is trans-ferred.

The adductor contractures between the thumb and index fingers and scars on the surface of the hand and digits may have to be repaired in advance. In metacarpal transplants, usually split skin grafts are used to cover raw surfaces. If nerves, bones or tendons are exposed, they should be covered with full thick-
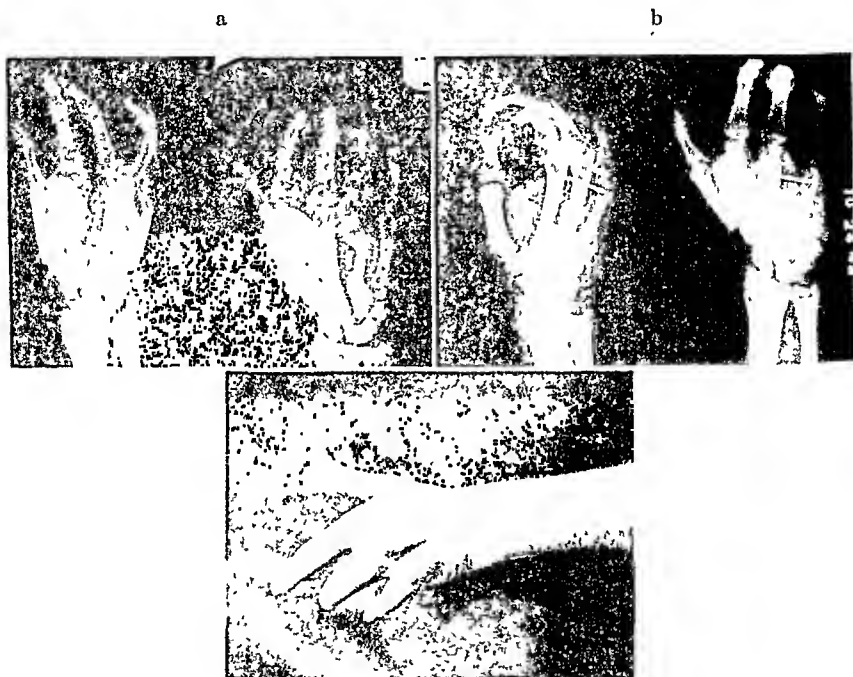
Case V. R. B.

Fig. 5a. X-rays showing malunion and deformity of fourth metacarpal.
Fig. 5b. X-rays post-operatively, showing transfer of little finger with fifth metacarpal o the fourth metacarpal by osteotomy.
Fig. 5c. Post operative results.

ness graft. A history of osteomyelitis and date of wound healing should be recorded. Surgery is performed four to six months following healing date if the organism is susceptible to the sulfonamides or the penicillin groups. Otherwise it may be better to wait a year. Foreign bodies, if present, should be removed. However, in some cases, it is not possible to remove them without adding to the damage of the hand.

Where there is amputation of the thumb, long or ring fingers or their adjoining metacarpals, because of tumor, transfer may be carried out immediately or may be delayed, depending on the type of lesion present.

ANAESTHESIA

In most cases, brachial block with procaine, reinforced with elbow block, is used. Spinal anaesthesia is used for the removal of skin, bone tendons or fascia from donor sites. Of course, a general anaesthetic is sometimes necessary.

OPERATIVE TECHNIQUE

The operations on the hand are performed under a tourniquet after the extremity has been depleted of blood by the application of a Martin or Ace bandage.
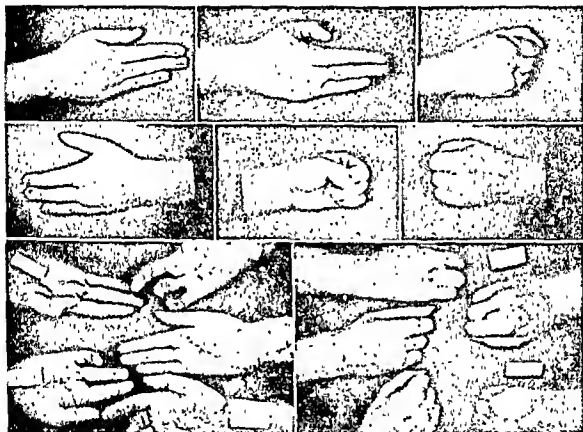
PLATE II

The tourniquet may be left on for an hour, depending on the judgment of the surgeon, then released for ten minutes, and the spurters ligated. The tourniquet may be reapplied if there is further work to be done in a bloodless field.

Both cancellous and cortical bone grafts have been used. Cancellous bone is preferable because it heals usually in six weeks and is easy to handle. Bone grafts must be of adequate size. If there is a question of the size of the graft, it is better to make it large, as it will later conform to the proper size after usage of the hand is begun. Decorticated iliac bone is usually used, but when added strength is necessary, cortex may be left on one or two sides. Cancellous bone

chips must be placed in the exact position bony growth is desired, otherwise they will produce bone in an undesired area. If placed near a joint, they will frequently produce a block. One ilium can be used two or three times as a donor area, as there is some regeneration of bone.

Complete excision of all cicatrices is imperative. Free tendon ends should be removed from the palm proximal to the volar carpal ligament and reattached to a tendon with a common muscle belly.

In regard to sutures, stainless steel wire is used for the skin. Subcutaneous and subcuticular pull-out wire sutures are used in some instances, where applicable. Occasionally a stainless steel wire suture is buried in a tendon repair. However, it is better to have no foreign material that might interfere with the gliding function of the tendon. Stainless steel pull-out wires are used for tendon repairs (according to the Bunnell technique). 7-0 black silk is used for digital nerve suturing. Wire sutures in the palm and around the clefts have proved invaluable because they produce good apposition and splint the skin edges without tension.

In the case of transfer of the index or long finger to take over the function of the thumb, the skin flaps are so constructed that they cover the transferred digit and cleft with normal hand skin where possible. Thick split skin grafts are used to cover raw surfaces and defects. If nerves, bones or tendons are exposed, they should be covered with full thickness graft; a tube pedicle can be prepared in advance, or can be constructed and attached all at the same time. The digital nerves should be split and the two volar digital arteries transferred intact, after severing and ligating the volar arch. The tendons are transferred with the digit and the interossie with nerve supply are preserved and transferred where possible. A similar procedure is carried out when a metacarpal is transferred without a digit.

SUMMARY

1. a. In loss of the thumb with loss of the distal two-thirds of the first metacarpal, with a good carpo-metacarpal joint, transfer of the index finger with the second metacarpal, with skin, blood vessels, nerves and tendons, will give an ideal result if all the muscles and tendons are present in the stump of the amputated thumb. Shortening of the index finger also improves the function of the new digit, but it is not necessary.

b. Where the thumb with all of the first metacarpal is lost, the second metacarpal with the index finger may be transferred to the greater multangular carpus. The metacarpal will then have only slight motion, depending on the motion found in the greater multangular bone. The digit will have the functions of flexion and extension, and may have abduction and adduction.

2. Where there is amputation of the thumb with the first metacarpal, and the index finger at the proximal joint, the second metacarpal may be transferred, with the palmar tissue, nerves and blood vessels, for a thumb.

3. Where the thumb and index finger with their metacarpals are lost, the third metacarpal, with the long finger, may be transferred to make a thumb.

4 Loss of the thumb and index finger with their metacarpals, and amputation of the long finger at the proximal joint may be an indication for transfer of the third metacarpal with palmar tissue, nerves and blood vessels

5 Where there is loss of the long finger with the head or all of the third metacarpal, transfer of the second metacarpal with the index finger, with or without bone graft, gives a good compact hand, with normal function, normal sensation and good cosmetic appearance

6 Where there is amputation of the ring finger with the head or all of the fourth metacarpal, transfer of the little finger, with the fifth metacarpal, to the base of the fourth, gives the same results as in the case of amputation of the long finger

7 Where there is extensive damage to the vital structures of the long finger and the third metacarpal area has skin destruction, amputation of the long finger with the distal three fourths of the third metacarpal, and transfer of the index finger with its metacarpal to the third metacarpal base, improves the function, cosmetic appearance and dexterity of the hand

8 Where there is similar extensive damage to the ring finger, the ring finger, with the distal three fourths of its metacarpal, may be amputated and the little finger, with the distal three fourths of the fifth metacarpal, may be transferred to the fourth metacarpal base

CONCLUSION

Metacarpal transfer, as described in this paper, gives the patient a hand that is ready for use in a very short time   It has the advantage of carrying with it its own nerve and vascular supply, and the special sensations of the hand, along with stereognosis, are retained

A general policy in hand surgery has been to preserve the length of the digits and the breadth of the palm   However, in the above cases, disregard of this rule has created no disadvantages, but has, on the contrary, improved the strength, function, durability and cosmetic appearance of the hand

In the author's experience, based on a series of thirty four cases, transfer of metacarpals, with or without digits, has proved to be an effective and efficient method of repair of certain types of crippled hands

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THE SURGICAL REPAIR OF NASAL DEFORMITIES

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It is my purpose to consider in this report the various types of nasal disfigurements commonly encountered and the methods which, from personal experience, have served best in attempts to correct these deformities. No claim for originality is made in the methods used. All of us engaged in this type of work gain from each other's experience. To my older colleagues, much presented here is familiar. However, we must remember that there is ever a younger generation who may be saved some of the disappointments that come with poorly planned procedures.

INDICATIONS FOR CORRECTION

It would seem that the decision as to whether surgical correction of a nasal deformity should be advised would be much simpler than the actual restoration. This is not always true. The reconstructive steps deal with known facts concerning anatomy, the physiology of transplanted tissues, and fairly definite rules concerning the relations of facial features.

The decision to restore or remodel a deformed nose must take into account the more indefinite mental reaction of the patient to the disfigurement and weigh the chances of his ultimate satisfaction. If his psychic make-up seems to be unstable, there is a good chance that the objective of physical and mental satisfaction will not be attained, even though the reconstructed part is surgically and artistically good. As a rule the patient who is dissatisfied with a relatively normal nose and cannot state in a few words a concrete objection either to form or function will, on deeper questioning, have multiple complaints based more on fancy than fact. In these patients surgery is inadvisable unless attention can be focused on some definite easily corrected abnormality, and even then is questionable as there will often be a shift of the complaint to some other part of the body.

It is at times difficult to foretell the reaction of the patient to a reconstructive procedure and in such instances the patient should probably be given the benefit of the doubt.

As a working rule, one can state that the greater the disfigurement, the greater are the chances of a reasonably good correction affording satisfaction.

TYPE OF DEFORMITIES AND METHODS OF CORRECTION

The deformities presented for correction may be divided into three large groups: excesses, deficiencies, and distortions of the normal. One or more of the three structures may be involved. The disfigurement is usually due to developmental defect, trauma, or disease, or its treatment.

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Skin Losses

The skin alone may be involved.   Losses of nasal skin with the framework and
lining intact may be repaired either by free full thickness transplants or by pedi-
cled flaps.   Usually free transplants should be limited to losses over the upper
half or third of the nose.   In this region the framework is rigid enough so that
adequate pressure may be accurately maintained for the period of five to seven
days needed to insure the successful take of a free graft.   If attempts are made to
repair skin losses about the nasal tip and particularly on the alar rims with free
grafts, failure may ensue due to difficulties in maintaining the graft snugly in its
bed.   For this area one had better take the longer course of pedicled repair.   In
either event the skin should be selected for color and texture match.   The best
sites in order of preference are the forehead, adjacent facial skin, postauricular
area, and neck.   These losses of skin alone are usually of fairly limited extent
and the donor site most commonly selected is the postauricular region since in
both men and women there is a fair amount of skin available and the scar result-
ing from its removal is hidden.

Excesses of Skin (Rhinophyma)

This is a disease in which the lining and framework are normal although due to
the dragging weight of the redundant tumors of the skin there may be some
stretching of these structures.   It is a hypertrophic form of acne rosacea.   It
may occur on the adjacent skin of the cheeks as well as the nose.   In its early
stages the nose has the familiar bulbous, red tip associated in the lay mind with
excess use of alcoholic beverages, but there is no proven connection.   It is not a
true hypertrophy of all elements of the skin but mainly of the sebaceous glands
which become enormously enlarged.   Grape-like clusters of hypertrophied skin
may hang from the nasal tip to the extent that nasal breathing and even eating
are hindered.   The deformity is easily corrected by merely paring the nose down
to normal contour.   There may be enough remnants of epithelium left to heal
the area or healing may have to occur from the edges.   This spontaneous healing
is preferable even though the denuded area may be of fair size for the contraction
that occurs during healing tends to shorten the elongated nose to more nearly
normal length.

Saddle Nose

This deformity is due to a loss or displacement of the normal support of the
upper two-thirds of the nose.   It results in a disfiguring loss of nasal form, and
loss of function due to decrease of the antero-posterior diameter of the airway.
Most commonly, the nasal septum is the structural unit which is deficient.
There is a certain stigma attached to this disfigurement since one of the causes
of saddle nose is syphilis.   To the experienced eye there is no difficulty in dis-
tinguishing this variety from those caused by other agents.   Syphilis destroys
not only the framework but the lining, and at times, the skin too.   Where there
is no skin loss, not only a saddle develops but due to shrinkage as the lining heals
by scar, the nose flattens and shortens.   To correct this deformity one must
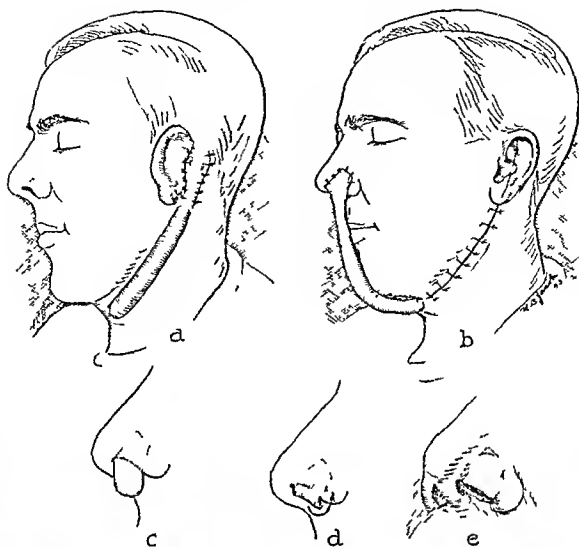
Fig 1 Loss of left alar rim from dogbite Repaired by transfer of left postauricular skin on tube flap whose base was in left submaxillary region (a, b, c, d, e) A Left alar loss and tube constructed B C Final result
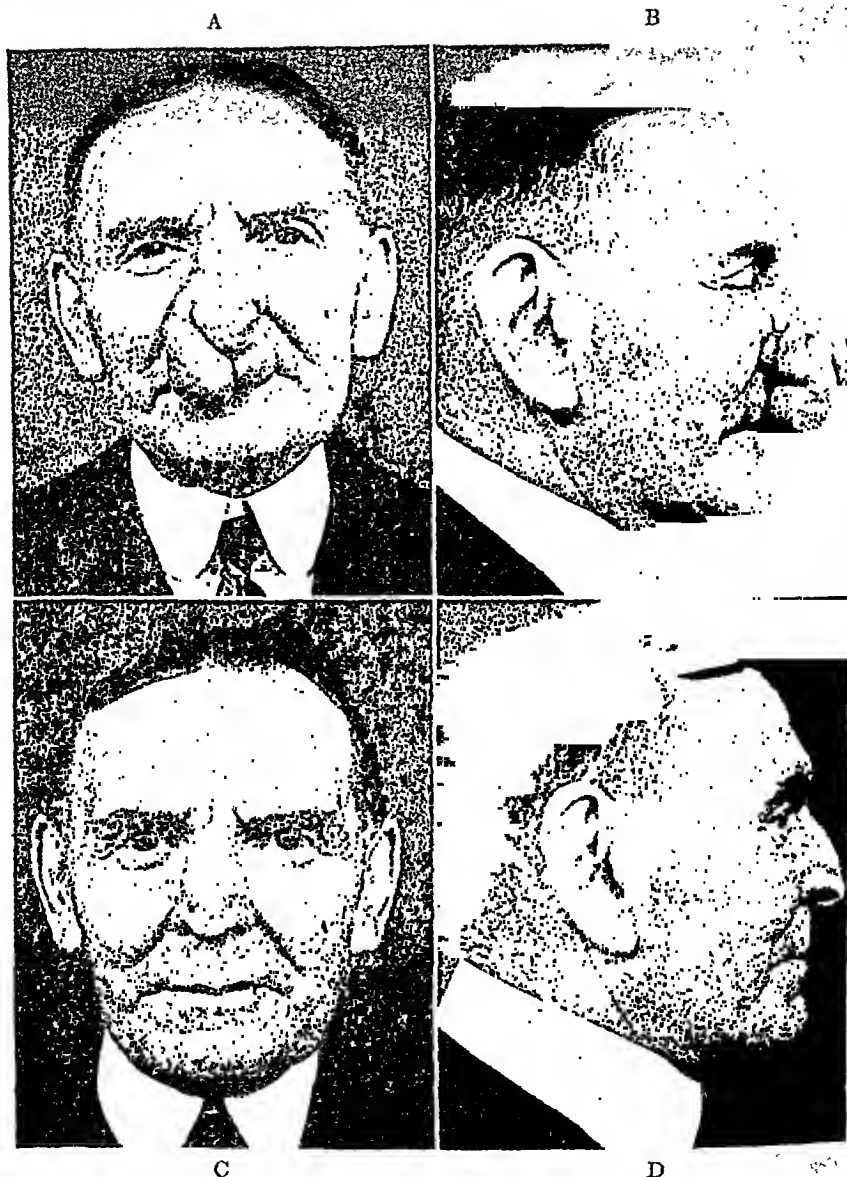
FIG. 2. Far advanced Rhinophyma. (A, B). After shaving off the tumors until the nose was of normal contour, the tip and alar areas were completely denuded of epithelium. Since the nose was elongated due to long-continued stretching, it was allowed to heal from the edges. The contracture which occurred with healing corrected the lengthening. (C, D).

remove the scarred lining, replace it with skin, if necessary add to the skin which may also have shrunken, and then support the newly lined and partially covered organ with cartilage implants. Fortunately this deformity is becoming rarer as syphilis is more widely and adequately treated.

A   C

B   D

Fig. 3. Saddle nose due to trauma. This moderate sinking in of the dorsal line of the nose was due to being thrown forward against the windshield in an automobile accident. Nine months after injury, a submucous resection was done to relieve obstruction of the left airway. He was then referred for correction of the deformity. (A, B) In addition to the denser. It was thought how the result obviously made from a mask.

On the other hand the traumatic variety of saddle nose is probably more frequent due to high speed transportation accidents. In compound fractures there may be an actual tearing away of the skin and framework of the nasal dorsum, but more commonly a simple fracture displaces the septum and lateral cartilages backward in accordian fashion. If the displaced fragments are not realigned and elevated into correct position within a few days of the injury, they become so firmly fixed that dislodgement is impracticable.

A falling-in of the nose may also be caused by destruction of the quadrate cartilage by pyogenic infection and by too extensive removal of the septum during submucous resection. The former may cause a pronounced disfigurement as the major portion of the cartilaginous septum may melt away leaving the inferior horns of the alar cartilages as the sole support. The saddle nose which develops following submucous resection is usually rather minor in character. It can be avoided if the rhinologist leaves a sufficient strip of cartilage dorsally and a strip at right angles to this at the anterior septal end. At times due to the character of the septal deviation this may be impossible and the operator probably mentally accepts lessened support to gain improvement in function. This in the end may defeat itself because if the nasal dorsum falls in enough, one substitutes an antero-posterior decrease in airway for the lateral obstruction originally present.

As far as correction goes, depressions of the nasal dorsum not due to syphilis, can be considered in one category. The principle of correction is to either rearrange the framework so that the dorsal line is elevated, or substitute a graft of costal cartilage. Re-arrangement is usually applicable only to minor depressions. In the major depressions the cartilage graft is inserted under the skin and may be used as a cantilever resting only on the bony nose or as an L shaped strut which rests on the nasal spine of the maxilla. If this type of support is used, a hinge of perichondrium should be provided at the right angle to allow some motion of the tip and reduce the danger of fracture of the graft. If such a correction is carried out after determinations have been made from models, the nasal form should be more pleasing and the intake of air improved.

The Humped or Long Nose

These are noses which are not pleasing and may have minor impairments of function. Surgical remodeling should be attempted only when the nose is grossly out of harmony in the facial ensemble and when the patient, after due consideration, sincerely wants the correction as outlined. In most instances a long nose with a narrow hanging tip is a poor airway. Shortening such a nose and elevating the tip allows more direct ingress of air and prevents alar collapse on inspiration. However, a majority of such patients desire only an improvement in appearance, and for this reason are hypercritical of the final result. Because of this, particular care must be taken preoperatively to arrive at a solution satisfactory to the patient and surgically feasible. If the patient's desires are not compatible with a rational surgical plan, then the correction should not be attempted.

The principle of correction is to decrease the framework so that the desired

A   C

B   D

Fig 4 Marked saddle n
genic infection (A B) N
appearance improved by a

contour is obtained   In some instances it may be necessary to reduce all dimen
sions   It is possible to decrease length straighten the profile line narrow the
nasal bridge, and change the angular relations of the nose to forehead and lip

Such changes in the framework are usually of rather small proportions and

B

D

FIG. 5. Typical saddle nose due to submucous resection. This deformity usually develops gradually following excessive removal of septum. This man fourteen years before had a submucous resection which relieved nasal obstruction but deformity of the nasal tip occurred. (A, B) Correction carried out by implanting an autogenous rib cartilage graft to fill out the dorsal line and an L shaped piece in columella and septal defect. This supported the tip satisfactorily and improved nasal breathing. It was necessary to trim off some cartilage on the left side of the dorsum about six months later due to slight slipping of the dorsal strut. C. D. Final result.

FIG. 6. This petite young woman had a large, humped, hooked nose. (A, B) Her reaction to it was perfectly sane. When asked why she had consulted me, her remark was that the reason should be obvious. She had no complaint other than appearance. In this type of nasal enlargement all elements of the deformity must be taken into consideration or the result is apt to be disappointing. Correction consisted in brief in 1. Straightening and lowering the profile line. 2. Shortening the nose by excision of the septal tip and a triangle from the alar rather than the lateral cartilages, 3. Narrowing the nasal bridge, and 4. Correcting the downward hang of the septum. (a, b, c) The surgical and artistic result was good but the family were quite upset for about three months. (C, D) In the end everyone was satisfied. Such a mental upset may occur in either patient or family and should be guarded against by careful explanations beforehand.

Fic 6
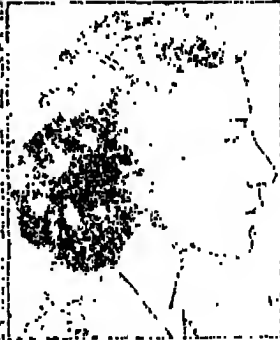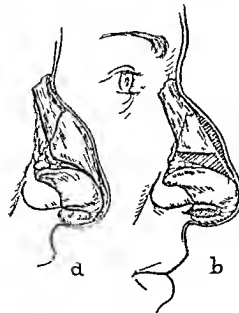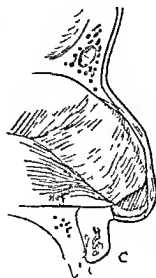
Fig 7. Humped nose with impairment of nasal breathing. (A, B) This woman stated that she had difficulty in nasal breathing which seemed to be improved by elevating the tip of her nose with her finger   In addition she complained of severe pain in the nose which was associated with the impaired entrance of air. She objected to the shape of her nose but this was of secondary importance   She was told that appearance and impaired nasal breathing could be improved but as there was no rational explanation for the pain, relief of this was doubtful. C and D show the appearance postoperatively. Breathing was greatly improved and for some unknown reason she stated she no longer had the pain.

must be done with great care, as a few millimeters off one way or another may produce a nose which is artificial in appearance, or actually slightly deformed.

A   C

B   D

stated that she wished
this was a deep rooted
short noses I simply
confess was somewhat
bial increase and the
well satisfied with the

This is particularly true in attempting to change the contour of the nasal tip
As mentioned above, the skin of the nasal bridge will readily shrink to fit a re-

Fig 9. This young man of 23 had no complaint other than that his nose was too long
The nose was shortened through intranasal incisions   A triangle was removed from the
quadrate cartilage and from the superior edge of each alar cartilage   He was completely
satisfied with the result shown in C and D

Fig. 10. The appearance of this young woman, as shown in A and B, was not pleasing and
she complained that her nose was flat   It was difficult to decide just where the fault was
although obviously about the tip   I finally decided that this was really a congenital retro-
cession of the maxillary base on which the nasal tip rested and that this resulted in 1. an
apparent retrocession of the upper lip, 2. alae whose bases were too far laterally, 3 a short
columella, and 4. a low profile angle from the bony nose downward.   I thought that it
might be possible to bring the nose forward by inserting a bone graft under the septum after
prying it upward off the vomer.   This was attempted through an intraoral incision, but the
septum was so flimsy that it would buckle when the wedge was placed under it.   Conse-
quently, the idea was abandoned   The soft tissues of the cheeks were advanced, (a, b, c)
the columella lengthened from mid section of the lip, the nostrils narrowed by diamond
shaped excisions in each floor and the nose shortened. (d, e, f)   This was accomplished by
one operation   The result (C, D) was quite pleasing to the patient   The surprising thing
is that such minor changes cause such a major improvement in the general appearance of
the face

A   C

B   D

a   b   c

underm ned area

d   e   f
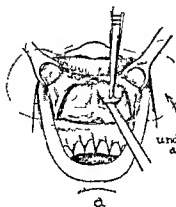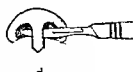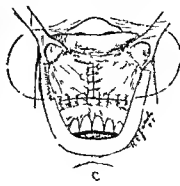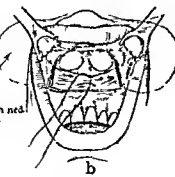
duction of framework.   But about the tip of the nose one must be careful not to remove too much of the alar cartilages since the skin may not readjust.

Nasal Retraction

In this group are included those deformities of the nose due to either failure of development of the maxillary foundation or lower nasal skeleton, or to ulceration and subsequent shrinkage of the lining.   The disfigurement is usually confined to the lower half of the nose and consists of an abnormal flatness of the nasal tip and mal-relation of the nose to the upper lip.

In the congenital variety the forehead nasal angle is well below 30°.   On analysis this flatness is found to be due to a combination of retrocession of the maxillary foundation, shortness of the columella, and imperfect development of the quadrate and alar cartilages.   From in front the nose appears short so that the nostrils which are small and malformed are visible.   In profile the base of the ala is set back in the face so that it may be in line with the corner of the mouth. The profile line of the upper lip is inclined backward instead of being in the vertical face line.   These same deviations from the normal are present in retraction due to scarring and insufficiency of the lining.

The plan of correction must take into account the backward position of the maxillary foundation.   If the nasal tip is brought forward without correcting this, some improvement results but there is still noticeable disfigurement.   It would seem that one could loosen the septum at its base, and, if necessary, the naso-maxillary processes, pry them forward, and hold this forward position with bone wedges.   This I have tried, and without success.   The failure is probably due to the weak, flimsy character of the quadrate cartilage which tends to buckle.   A more satisfactory solution is arrived at if one moves soft tissues forward on the undeveloped framework and then superimposes grafts of cartilage to maintain this advancement.   The columella usually has to be lengthened in the process.

Nasal Distortions

These deformities are due not to losses of any of the three components of the nasal wall, but to disarrangement of the bone and cartilage framework.   They are usually due to trauma or to congenital abnormalities.   The prevention of these distortions is much simpler than their correction at a later date.   Fractures of the nasal bones, lateral cartilages, and septum should be replaced in normal alignment as soon as possible following injury.   If early reduction is carried out intelligently and efficiently, distortion should not occur, with the possible exception of those injuries sustained in childhood, where distortions at times may occur during growth even though the original reposition may have been satisfactory.

The distortions due to trauma may usually be grouped into those where there has been a lateral shift of the nose or a backward and upward displacement. Usually the deformity involves distortion of both bone and cartilage.   In addition to the obvious deformity there is often impaired nasal breathing.   In the lateral shifts of the nose the septum is either displaced from its base so that one airway is larger and the other smaller than normal, or it may be fractured and

A   C

B   D

Fig. 11. A and B show a typical case of congenital nasal retraction, or more accurately, congenital failure of forward growth of the nose. There are obvious deviations from the normal: high, hump-shaped shortness of the nose, a decreased nasal-forehead profile nostrils, and a retro-correcting the back-t. The final appearance illustrated in C and D was obtained in four separate operative steps: 1. advancement of soft tissues, 2. lengthening soft tissues of the columella, 3 "I." shaped cartilage transplant to stretch the skin still further forward, and 4 after some months a hinged, cartilage transplant to construct the nasal tip.

buckled into an airway until it is practically completely occluded. There are innumerable combinations which may occur but the common denominator of

B   D

FIG. 12. This 7 year old girl was thrown forward against the windshield in an automobile accident. She was referred 2½ months after the accident for correction of the deformity shown in A and B. Examination showed the lateral cartilages had been driven downward and backward. At operation the lateral cartilages were freed from their abnormal attachments to the nasal bones, elevated, and held in correct position by mattress sutures passed through the full thickness of the nose. (a, b, c, d, e) This corrected the depressed dorsal line and will prevent further distortion occurring as the nose grows. (C, D)

all these lateral distortions is a crooked appearance of the nose and one occluded airway.

Correction consists of devising surgical means to re-arrange the framework. In most instances the bony deformity presents no particular problem. The nasal bones can be shifted by sawing through the naso-maxillary junction and the septal nasal junction on either side. Usually the bone on the side of the deflection is shorter than the other, and the long one must be shortened. The deformity of the cartilaginous portion is more difficult to correct. At times a partial submucous resection of the septum is necessary, in others a repositioning

a   b
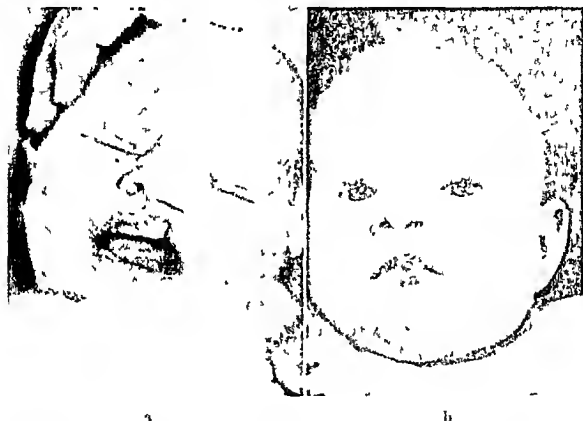
Fig 13 In all unilateral harelips there is an associated deformity of the nose. Unless the component parts of the nasal tip are correctly assembled in infancy or early childhood the deformity remains. In this instance a nearly perfect result was obtained at original operation

of the anterior end of the septum may be sufficient. In some instances where an S shaped curve of the dorsal edge of the septum is present, the curled over edge must be dissected free and either straightened by free incision at the points of curvature or actually shaved off. It is usually possible to correct the simpler lateral deformities at one operation, in some of the more complicated it may be necessary to first improve function and at a second stage correct the deformity

The backward and upward displacements are due to trauma from in front. The nose is struck directly on the tip and the dorsum. The simplest deformity which occurs from this injury is a tearing loose of the lateral cartilages from their nasal bone attachments and a crumpling of the anterior end of the septum. The lateral cartilages may be pushed under the nasal bones and unless immediately
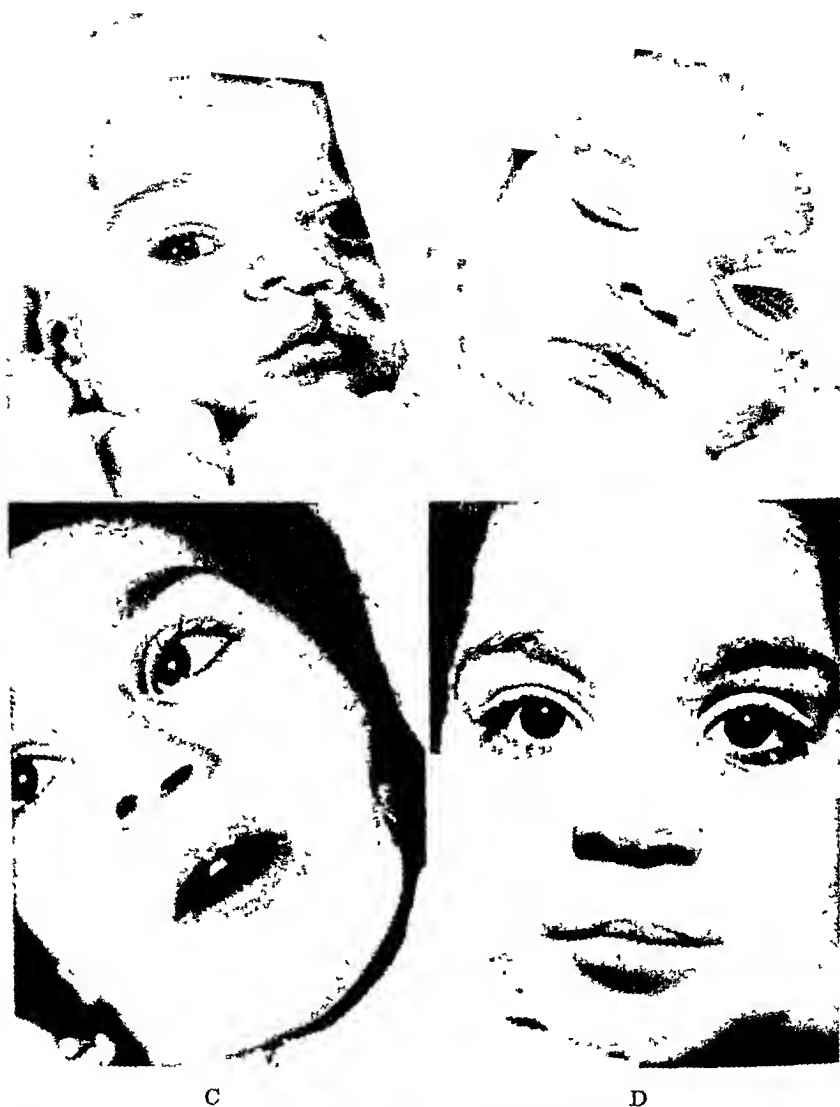
FIG. 14. This infant (A) had practically the same degree of cleft as illustrated in Fig. 13. The immediate result (B) (3 weeks post-operative) was not entirely satifactory. 3½ years later the deformity (C) is still present and perhaps a little greater. The left nostril's axis is horizontal, giving a flat appearance. This was corrected through an external nasal tip incision through which the alar cartilage was dissected free and placed in correct position. At the same time the irregularities of the lip were smoothed out. The result (D) is such that the child will reach adult life with very little stigma of the original condition.

replaced become fixed in this position. This results in a moderate saddle of the middle third of the nasal dorsum. This deformity can oftentimes be corrected

Fig. 15. Traumatic and growth distortion of nasal framework. A and B show the de-
formity...

A   B

C   D

FIG. 16 I believe this is a true example of growth distortion occurring after early trauma
His mother stated that he had a severe injury of the nose when an infant but that no de-
formity was noted until he was 5   From then on the deformity gradually increased until at
19 his appearance was as shown in A and B.   He had been a mouth breather and at 17 a
submucous resection had been done with improvement of nasal breathing on the left but
not on the right.   The anterior end of the septum was found to be far over in the right nares
with its dorsal edge bent over to the right   Correction was accomplished by removing the
hump, and fracturing the nasal bones inward with forceps without maxillary detachment.
The septal base was freed with a chisel, the anterior end forced to the left and held with a
wire attached to the left canine tooth.   The result (C, D) shows improvement but would
have been esthetically better if the profile angle had been increased and the nose narrowed
by maxillary detachment of the nasal bones.   Nasal breathing on the right was improved
but was still not completely satisfactory
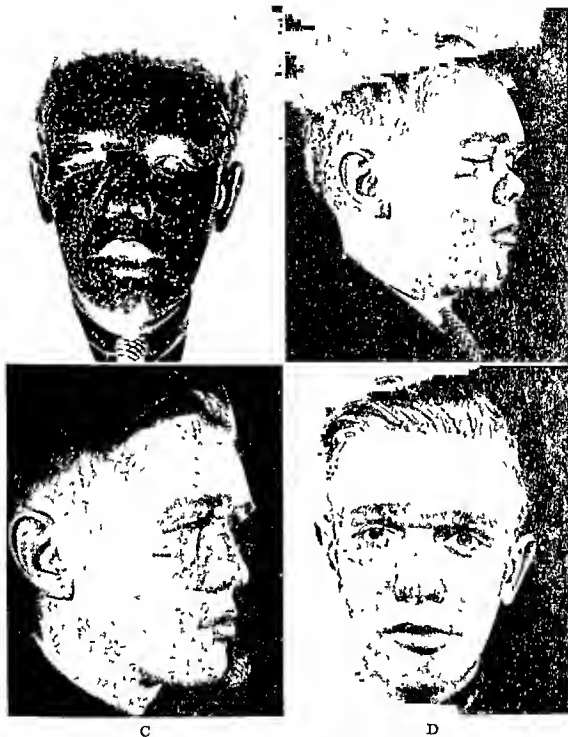
Fig 17 Extensive traumatic injuries of the soft tissues and facial bones such as this boy suffered often distort the nasal skeleton to such a great degree that it is impossible to safely reposition it In this instance the boy was referred . . . . . 1 . . 1 . . . . nasal bones had been driven upward, backward, a . . . . . been lost for the most part The nasal deformity . . . due not only to displacement of framework, but also to moderate loss of skin, skeleton and lining . . . .

even though present for a long time by a simple freeing and replacement of the
lateral cartilages.   In the more severe traumas of this nature there may be a
telescoping of the entire framework.   The nasal bones separate from their mid-
line attachments and flare outward, the septum is crumpled and displaced back-
ward, and the lateral cartilages are driven under and between the nasal bones.
This results in a short-broad-tip-tilted nose of bizarre appearance.   Nasal
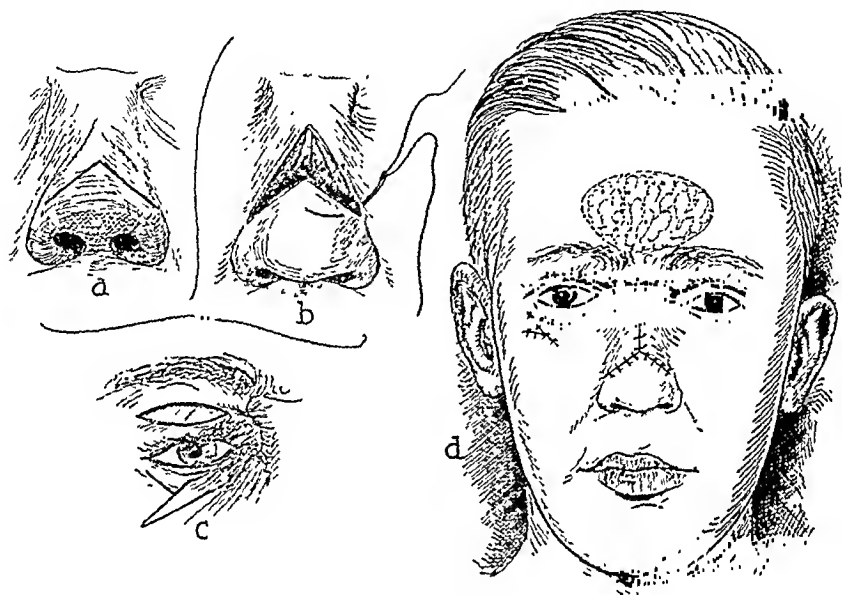
Fig. 17
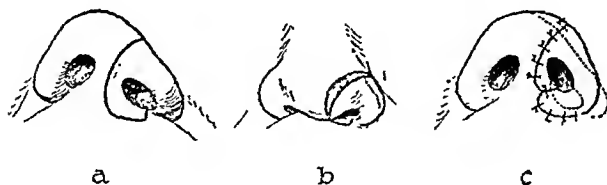
Fig. 18

breathing is inadequate due to the thickened septum and the displaced lateral
cartilages.   In long-standing deformities of this type it is impossible to reposition
the displaced fragments of the framework.   Usually one must resort to building
up and lengthening the nose by cartilage transplants after a preliminary clearing
of the airways and a perhaps imperfect attempt to restore some of the elements
of the nasal skeleton to more nearly normal position.
     Practically all nasal distortions of congenital origin follow harelip repairs.
In unilateral harelip, if the alar cartilage on the cleft side is not correctly placed
at original repair, a variety of deformities, usually limited to the one nostril and

FIG. 18. A, B, and C show the nasal deformity that persists if the alar cartilage is not

tip of the nose, occur.   The nostril axis may be horizontal instead of vertical with the alar rim flattened and the tip of the nose on the affected side lower than on the normal, or the rim of the ala when viewed from in front, may hang at a

FIG 19. The almost constant deformities following repair of double harelip by removal of the premaxilla, undergrowth of the maxilla after forcible closure of bony clefts, or flatness of the upper jaw if the premaxilla is displaced too far backward, are well illustrated in this case.   There is flatness and horiozntal shortness of the upper lip, protrusion of the lower lip, prolongation of the mandible with increase in angle between the ascending and horizontal rami, occlusion of teeth and flatness of nasal tip due to malposition of alar cartilages which is due to growth with a short or absent columella. (A, B, C).   Nasal and upper lip disfigurement were corrected or camouflaged by advancement of soft tissues, transference of lower lip flap to upper, (b), reconstruction of columella by flap from hand (a), lowering nasal profile line and repositioning alar cartilages.   Final result (D, E, F) obtained in 9 operative steps one of which included removal of the protruding edge of the mandible to shorten the face.

lower level than its fellow.   The columella may be displaced from the midline toward the sound side with an accompanying obstructive deviation of the septum.   In some instances of very poor original repairs there may be an oblique position of the entire nose which involves the bony nose as well as tip.

In individuals who have had double harelips the most frequent deformity is a flat-broad tip with flaring ala and a short columella.   In extreme instances the

tip of the nose may almost appear cleft due to the wide separation of the alar cartilages This deformity is due purely to a malposition of the alar cartilages Due to the excessively short columella, the inferior horns of the alar cartilages

a

b
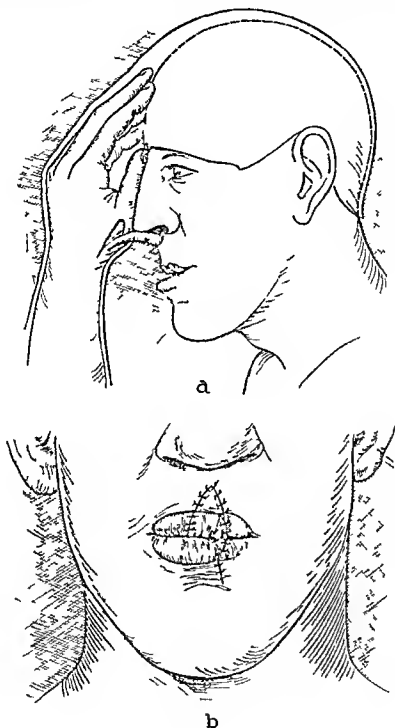
Fig 19

are rudimentary and the angle between these and the wings of the cartilages much more obtuse than normal

In the unilateral deformities the problem resolves itself into finding an efficient method to reposition the alar catrtilage In the double deformities the columella must be lengthened as well as repositioning both alar cartilages

a. cut | flap from forehead | sutured
b. cut
c. columnella
d.
e.

A   C
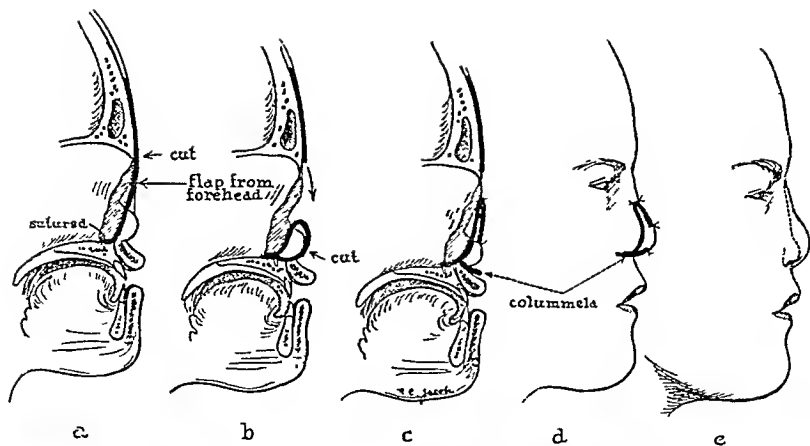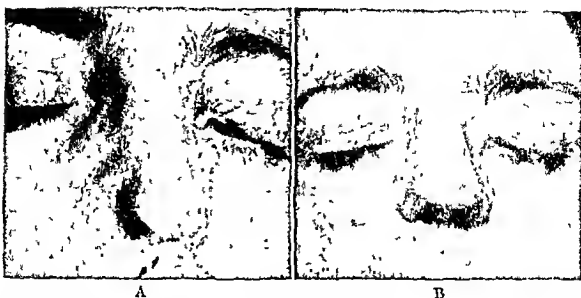
Fig 21.
The alae w
Nasal breat
lining with Thiersch grafts held in place with a wax form
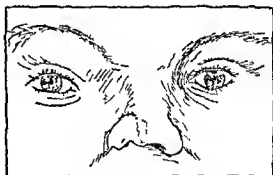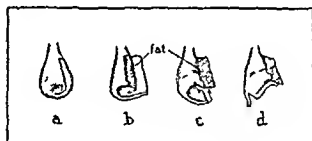
Fig 22

Losses of Lining

In the nose in which there has been an extensive lining loss, there is necessaril a rather extreme derangement of function, due to airway obstruction. Th

c, d, e) Six operative steps before result C, D obtained. This will be further improved in few years by adjustment and trimming about the left nares

A c — b — c — d — e **C**

B

D
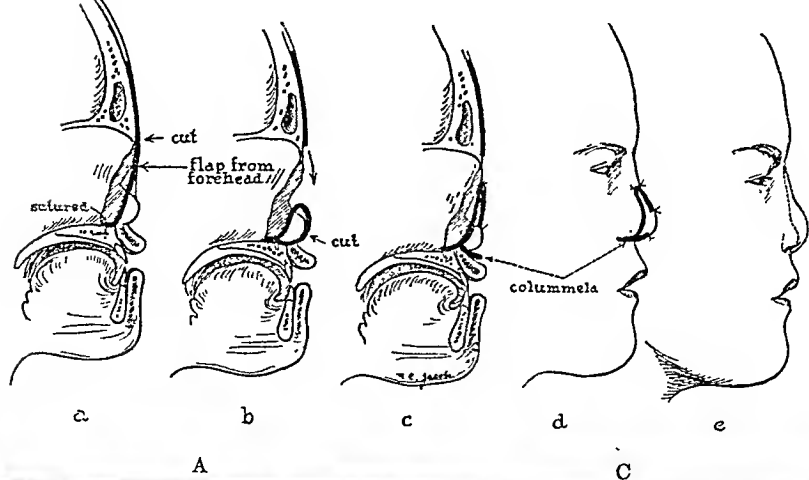
Fig. 20

Fig 23 (A, B) A dog bit off the tip of this 9 year old girl's nose when she was two . . . . nasal breathing . . . . un be done with . . . . i . l that the loss of . . . . Consequently a small forehead flap was used Result (C, D) after four operative steps

occurs only when the skin covering has remained intact and the healing of the lining by scar causes a puckering in of the covering This, in turn, usually pro-duces visible external deformity These losses, of lining alone, are due to extensive ulceration from infection, particularly syphilis, in which instance there may

A   C

B   D

FIG. 24. (A, B) This 20 year old young man at the age of 5 had most of his nose torn away in an auto accident. Following this he had been subjected to 23 surgical operations in another city. These had been performed over a period of years but evidently by an incompetent surgeon. There were incisional scars on the forehead as though a completely inadequate flap had been used and probably lost, another on the right upper arm, and scars on the thighs where Thiersch grafts had been taken. So much had been done and so little improvement resulted that the parents were convinced that nothing could be done. This was strengthened by the fact that some of the failures had been explained by statements that the boy's blood was "bad." They were finally convinced that there was no reason an acceptable repair could not be made. The plan of repair was to save the columella and left ala, bring them down into normal position, line the midportion of the nose with a flap from the bridge, and reconstruct nasal covering and lining of left ala with a forehead flap. This was accomplished in 8 operative steps (a, b, c). At a final stage some months later an autogenous cartilage graft was inserted for support and to bring the completed nose to final appearance as shown in C and D.

be framework and covering loss as well; and to burns which may destroy covering
and lining about the nostrils which results in more or less complete atresia of the

Fig 24
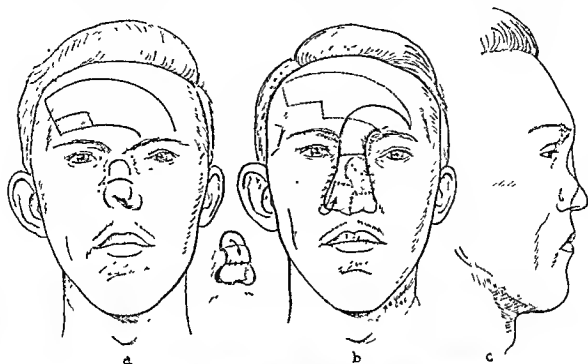
years duration.
disfiguring loss
one constructed.
(B) Following healing after first operation at which forehead flap was delayed and nose
destroyed by cautery. Result, C, obtained in three steps by forming nasal lining and cover-
ing by large bi-lobed forehead flap.

nasal openings. In some instances of congenital nasal deficiency there is such
inadequacy of the lining that it must be treated as a loss.

The treatment of these losses of lining is best accomplished by substituting
grafts of skin for the lost mucosa. There is no handy site from which enough
mucosa can be safely taken for repair. Skin is not an entirely satisfactory sub-

stitute for mucous membrane but is the best available. The greatest objection
to a nasal lining of skin is that the epithelium being constantly subjected to
moisture macerates and gives rise to a quite unpleasant odor. This occurs more
when the lining is composed of a flap of skin and subcutaneous tissue than when
a free thin graft is used. This is probably so because in the flap oil and sweat
glands continue to function and these secretions mixed with the constantly
desquamating outer epithelium when softened by moisture give rise to the odor.
A free graft of less than full thickness skin is less objectionable in this respect but

a   b   c

FIG. 26. Many times recurrent carcinoma of nose invading bone and cartilage of nose,
palate and maxillae destroyed elsewhere by cautery and radium needle implantations. Fol-
lowing sequestration of teeth, palate and portions of the maxillae she was in great distress
because she could not speak intelligibly nor eat satisfactorily. She also had to wear a
dressing because of the disfigurement. Because of the history of many recurrences she was
advised that surgical repair should be delayed 2½ to 3 years. To tide her over this period an
artificial denture (A) was made. This was constructed by Dr. T. C Sample under our direc-
tion. It was a difficult job because there was only one tooth on either side left to be used
for holding The denture helped her in eating and speaking and from our viewpoint pre-
vents contracture of the remains of the upper lip. The artificial nose was constructed by
us from latex, note the prolongations on the spectacle nose piece to hold the prosthesis in
place. She wore this for 1½ years and is grateful but in spite of many previous surgical pro-
cedures insists that when safe, she wants a lip and nose of her own tissues made.

has other disadvantages. Among these are, the lower percentage of complete
take, the absence of any filling material which may be needed in the nasal floor
if there has been retraction of the nose, and the tendency of the reconstructed
airways to contract.

Partial and Complete Losses

Most of the deformities of this type are due to either injury or disease or its
treatment. In occasional instances there may be congenital absence of parts of
the nose. When all three elements of the nasal wall have been lost repair is
generally carried out by reconstructing the covering and lining from skin and if
necessary replacing the lost framework whether bony or cartilaginous with
cartilage. The skin in most instances is secured from the forehead. This site

is used even though it means some disfigurement because the color and texture of the skin is correct and it is thickness is such that it accommodates itself easily to modeling. In our experience the scars on the forehead are more readily accepted by the patient than a flabby, soft skinned, off color nose. In partial nasal losses those parts which remain, if acceptable, are saved and used in the repair. This at times may mean moving them from distorted positions, but this is worthwhile since if not deformed a displaced ala, for example, is of better contour than one can make.

The repair of a full thickness loss of the nose in our hands resolves itself into about five operative steps three of which are done under local anesthesia. A flap of the correct size and shape is elevated and delayed on the forehead on two occasions about ten to fourteen days apart. These two steps are done under local anesthesia without hospitalization. At the third step under general anesthesia, and in the hospital, the flap is turned into place and its end folded under the lining. At this step the forehead is grafted with either a full thickness or thick split thickness free graft of skin. In four to six weeks the flap is securely grown into place and at this time the pedicle is divided and whatever remains returned to the forehead. This step is done in the hospital under general anesthesia. The return of the pedicle means that some of the previously grafted area on the forehead is discarded, but this has proved to be a better plan than allowing the forehead wound to remain open to granulate and grafting at the time of pedicle return. A varying period of two to six months is then allowed to pass so that whatever shrinkage there may be will take place. During this interim the skin of the new nose softens and decision can be made as to whether support may be needed. The fifth and usually last step is for necessary modeling and perhaps the insertion of a cartilage graft to support the tip and dorsum.

In nasal losses prostheses are of value although limited due to the fact that most patients prefer a nose from their own tissues. However, in the occasional instance where surgery is contraindicated due to age or physical condition, a properly constructed prosthesis makes the patient less conspicuous and more comfortable. A greater usefulness is in the covering of defects following the eradication of malignancy where a waiting period is at times necessary before repair can be safely undertaken.

PLASTIC SURGERY PROBLEMS IN THE TEXAS CITY DISASTER

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T. G. BLOCKER, Jr., M.D.
AND
VIRGINIA BLOCKER, M.D.

When news of the Texas City disaster first reached Galveston and we prepared to receive a large number of casualties, those of us in the Plastic Surgery Section anticipated a great many cases of severe burns and major avulsion wounds. As a matter of fact, however, patients with such injuries who were close to the explosion center did not survive other effects of the blast and were killed from dismemberment, primary blast injury to internal organs, or in the case of those standing at the dock edges by drowning.

At the John Sealy Hospital there was only one patient with extensive burns and these were received from hot water as a coffee urn was turned over in the cafeteria of one of the industrial companies. Six other patients showed small minor burns.

The first casualties to be received by the Plastic Surgery Division showed multiple lacerations of the face and neck. Many of them penetrated into the oral vestibule or nasal cavity. In others there was partial avulsion of the nose or ear. These wounds were contaminated with every imaginable type of debris: dirt, sand, molasses (from two large storage tanks near the site of the explosion), oyster shell, particles of wood, grass, grease, oil, etc. Patients who were indoors showed characteristically multiple v-shaped cuts from shattered glass windows with hundreds of embedded fragments and splinters.

As a general rule face wounds were closed with as accurate approximation of tissues as possible following thorough cleansing and careful debridement of devitalized tissue. Eight patients had fracture of the facial bones. There were five cases of fractured mandible, all of which were treated by interdental wiring and elastic traction. The majority of patients showed in addition to lacerations one or more fractures and/or eye wounds, perforation of ear drums, concussion and internal or moderately severe internal blast injury. Treatment was hence a matter of group responsibility of the various specialties under the supervision of General Surgery.

To the Plastic Service were assigned for post-operative dressings and care all maxillo-facial patients, those with hand injuries, and a number of those who required secondary closure of wounds of the trunk and extremities.

Approximately 300 disaster victims were admitted to the John Sealy and affiliated hospitals and to the convalescent unit at Ft. Crockett. Of these the Plastic Surgery Service assumed care of 69, and in addition saw 31 others in consultation. A total of 100 definitive reconstructive operations were performed for secondary deformities of one type or another. The most common lesions

Fig. 1. Deformity resulting from avulsion wound of the upper lip and cheek. The nose was also deformed in the injury. Repaired in multiple stages with scar excisions, rotational

D, Lateral view after reconstruction.

encountered were multiple cicatrices of the face from irregular lacerations produced by flying glass particles. Sufficient length of time was allowed to elapse for maximum spontaneous improvement and for subsidence of tissue reaction

before operation was performed in 27 cases. In most of these simple excision of
scar tissue and closure without tension could be accomplished. In some instances
where contracture bands had formed or there were adherent depressed scars and
in all patients with scars crossing facial folds or involving the eyelids and ver-
million border of the lips Z-plasties were utilized.
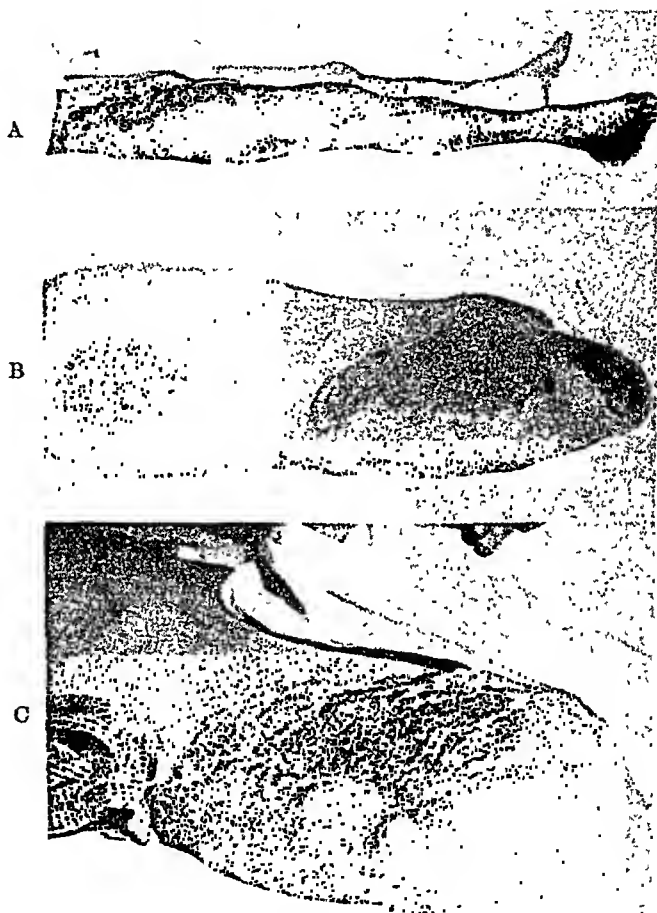
FIG. 2. Gangrene resulting from vascular injury.
A. Prior to amputation.
B. After debridement and amputation.
C. Repair with split thickness grafts and sliding flap.

One patient required an eyebrow transplant for an avulsion wound of the fore-
head. (He was treated initially with a split-thickness skin graft and then later
had a full-thickness graft from the posterior scalp.) Three patients had oto-
plasty for avulsion wounds, and three had rhinoplasty for deformities resulting
from fractures which had their initial treatment elsewhere.

A number of patients showed avulsion wounds of the trunk and extremities,

C

... face with severance of portions of facial nerve and
perforating wound of the right eyeball and laceration
the eye

B A good cosmetic eye has been placed in the right orbit which moves synchronously
with the normal eye. The vertical scars on the right side of face and neck have become
hypertrophied

C After scar excisions and Z plasties.

chiefly from the effects of flying particles of steel or other metal. Nineteen of
these were treated with thick split grafts, one with a rotational flap, and two

A   B

Fig 4 Loss of upper one-fourth of right ear.
A Before reconstruction
B After four stages of otoplasty with preserved cartilage implant.

A   B

Fig. 5 Avulsion wound of left eyebrow and compound fracture of underlying bone; deep lacerations over forehead and left cheek and avulsion wound of scalp.
A. One month after injury.
B. Reconstruction by scar excisions and full thickness graft including a small scalp graft.

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with cross-leg flaps.   Three who had had wide excision of necrotic tissue for suspected gas gangrene in the upper arm and the chest required skin grafting for adequate coverage before discharge from the hospital.   Two had stump revision operations and three or four had skin grafts for closure of stump defects where enough tissue was not available for secondary closure.   Seven patients on the Plastic Service had secondary closure of wounds which had been large and grossly contaminated on admission.

There were relatively few serious hand injuries.   Two patients required pedicle flaps for partial amputation.   Two of the hand cases had tendon repair, and one patient with an avulsion wound over the back of the ankle required suturing of the tendo Achilles.

Figures 1 to 5 show typical deformities treated by the Plastic Surgery Service.

SUMMARY

Plastic surgery problems encountered among Texas City disaster victims were chiefly severe lacerations complicated by embedded foreign bodies, facial fractures, and minor avulsion wounds.   Secondary procedures included chiefly revision of scars and covering of raw areas, for the most part with thick-split grafts.   Burns and severe avulsion wounds were conspicuously absent.

Following initial treatment of wounds, in which all services shared, the Plastic Surgery Service at the John Sealy Hospital took care of or saw in consultation approximately one-third of the casualties   During this period a total of one hundred plastic operations were performed.   Although they were for the most part of minor nature in the technical sense, we feel that the service played a large role in aiding those patients concerned to return to a normal life with a minimal amount of disfigurement or deformity.

COLUMELLA AND NASAL TIP RECONSTRUCTION USING MULTIPLE COMPOSITE FREE GRAFTS

REPORT OF TWO CASES

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INTRODUCTION

Progress in surgical technique is attained by the simplification of existing procedures. In attacking the problem of the lost nasal tip and columella prior to the recent war, reconstructive procedures utilized local or remote flaps (1). Such methods, requiring many stages and a great deal of lost time and expense to the patient frequently presented hurdles difficult for him to surmount. However, with the introduction of the composite helix graft by Brown, et al. (2, 3), and the ear lobe graft by Dupertuis (4), we have gained another weapon in our ever expanding armamentarium. In their excellent articles both Brown and Dupertuis have shown what can be expected by the application of these grafts. In the case reports presented in this paper these grafts have been employed to repair acquired defects. Could they not serve also in the reconstruction of congenitally shortened or absent columella with flattened nasal tip as is often seen in a double cleft lip?

DEFINITION

For purposes of clarification a broader view is here taken of the term 'composite free graft' so as to include by definition "any graft which carries tissue of more than one germinal layer." Thus, the helix graft, containing skin and cartilage, and the ear lobe graft, composed of skin and fat are both referred to as composite free grafts.

CASE REPORTS

The operative technique used in the following cases adhered to the principles laid down by Brown and Dupertuis.

Case No. 1. R. E. L., male, age 52 years, was admitted to hospital on August 13, 1947 from the Domiciliary with a request for repair of a nasal tip deformity. He gave a history of having lost the tip of his nose as the result of a human bite in March 1933. At that time an attempt was made to repair the lesion by the use of an arm flap. This was abandoned when the flap became infected.

On examination he was found to be a short, obese white male, with a partial loss of the tip of his nose and about 65% loss of the columella (figs. 1 and 2).

Routine laboratory examination, including urinalysis, complete blood count, serology and x-ray of chest, was normal.

On September 29, 1947 (14 years after the injury) the first stage of the repair was done. Under 1% procaine anesthesia all scar of the alae and tip was excised. A composite free graft was taken from the helix of the right ear which conformed to a pattern made of the fresh defect. The graft was anchored in place with one buried suture of #80 white cotton.

Fig. 1
Fig. 2

FIG. 1. CASE NO. 1. FULL VIEW OF NOSE BEFORE OPERATION
FIG. 2. CASE NO. 1. NOSTRIL VIEW BEFORE OPERATION
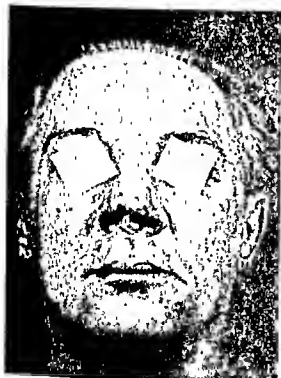
Fig. 3
Fig. 4

FIG. 3. CASE NO. 1. HELIX GRAFT SHOWING AREAS OF NECROSIS
FIG. 4. CASE NO. 1. FINAL APPEARANCE. NOTE INCREASED PIGMENTATION

The skin edges were approximated with interrupted sutures of 6-0 black silk. The nostrils were packed and pressure dressings applied over the nasal tip with a mold of dental impression compound. The dressing was not disturbed for seven days. The take was good and the graft showed only slight evidence of vascular embarrassment where three small areas

FIG. 5

FIG .6

FIG. 5. CASE NO. 1. NOSTRIL VIEW AFTER REPAIR OF COLUMELLA
FIG. 6. CASE NO. 1. REPAIRED HELIX AND LOBE

FIG. 7

FIG. 8

FIG. 7. CASE NO. 2. NOSTRIL VIEW OF DEFORMITY
FIG. 8. CASE NO. 2. PROFILE. NOTE LOBE AND COMPARE WITH FIG. 12

of skin necrosis developed. These healed rapidly without leaving any noticeable scarring (fig. 3).

Eight weeks later a composite free graft from the lobe of the left ear was used to correct the columellar deformity. The technique used was similar to that of the previous opera-

tion. However, on the fourth evening after operation the patient was taken with a fit of sneezing and the pack and pressure dressing became dislodged. On the following morning, as soon as this became known, the graft was checked and it showed an area of blistering and bluish-black discoloration in its center. The patient subsequently lost approximately 50% of the graft. The necrotic tissue was trimmed away and the area healed without further accident.

A second lobe graft, taken this time from the right ear, was done three weeks after the first attempt. This took without difficulty and all sutures were removed by the seventh day after operation (figs 4 and 5).

The lobe defects were repaired by simple closure at the time of the grafting. The helix defect (fig 6) was repaired in two stages as described by Brown

Case No. 2. T. W. B., age 32 years, was admitted to hospital with a history of having sustained the loss of his nasal tip and columella in January 1942 (5 years previously) when a

Fig 9   Fig. 10
Fig. 9. Case No 2. Graft 16 Days After Operation
Fig. 10. Case No 2. Profile After First Graft

dog he was petting jumped suddenly and bit it off. The nose healed without infection and despite an obstruction to breathing he was inducted into the army three months later

Examination revealed a healthy white male with approximately 75% obstruction to breathing, a markedly deviated nasal septum, absence of the columella and loss of substance of the nasal tip (figs. 7 and 8) The remainder of the examination was non contributory

Routine laboratory examination, consisting of urinalysis, complete blood count, serology, chest and sinuses x-rays, was normal.

On October 1, 1947 the first stage in the reconstruction was done A graft was taken from the lobe of the right ear and sutured into a defect created by excising the scar in the tip and restoring the alae to their normal relationships In order to get a good fit the graft was split part way. An anchor suture of #80 white cotton was placed in the subcutaneous tissue of the recipient site and thru the fat of the graft. Edge to edge approximation was attained by use of interrupted sutures of 6 0 black silk along the entire periphery of the graft. Vaseline gauze packs were placed in the nostrils and a pressure dressing was applied with wet cotton padding held by a mold of dental impression compound and adhesive On

FIG. 11   FIG. 12

FIG. 11. CASE NO. 2. FINAL RESULT, FULL FACE VIEW
FIG. 12. CASE NO. 2. RIGHT PROFILE. COMPARE WITH FIG. 8

FIG. 13. CASE NO. 2. FINAL RESULT, NOSTRIL VIEW

the seventh day after operation the dressing was removed and on the ninth day all sutures had been taken out. The take was one hundred per cent. Photographs taken at this time reveal the marked improvement in the appearance of the nose (fig. 9). This is especially noticeable on profile (fig. 10).

Four weeks later the second graft was placed. This was removed from the lobe of the

left ear and was used to rebuild the columella. The technique employed differed in no respect from that already described. Dressings were done on the sixth day and all sutures were out on the eighth day (figs. 11, 12 and 13).

It is to be noted that all sutures of the lobe donor areas were removed early, on the third to fifth day, and that these are is required little if any attention.

A submucous resection was done on November 28 1917. Thruout this entire period both these patients were ambulatory.

DISCUSSION

Partial or total losses about the nasal tip and columella are not uncommon in either military or civilian practice. These disabilities generally fall into two classifications (1) congenital and (2) acquired. The congenital variety is seen in those patients with a double cleft lip who have a markedly underdeveloped prolabium producing a depressed tip and a short or absent columella. Many of these patients have a nasal septum of normal elevation just back of the tip (5) and so it would seem a natural deformity to correct with a composite free graft. The acquired lesion may occur following bites, burns, infection, injuries from flying glass and surgical excision of neoplastic disease.

Many of these deformities lend themselves readily to repair by the use of a composite free graft.

Grafts are easily obtainable and require no elaborate set up. Except in young children these grafts can be done under local anesthesia.

The lobe is especially handy as a donor area since it can be repaired immediately after taking the graft, needs little after care and leaves no noticeable scar. It is also a perfect match for color and texture.

The helix graft, however, has several disadvantages:

1. must be no wider than 1 cm
2. requires two stages to repair the donor site
3. may take on a darker pigmentation
4. care must be taken not to separate skin from cartilage

Since there is apparently no limit to the length of a helix graft except the size of the ear, it can be used to advantage where a very large defect exists such as a complete loss of an alæ or, as in case No 1, a defect involving the entire tip plus a part of each alæ. Another advantage is the rigidity attained because of the presence of cartilage. This could have been used to advantage in case No 2 to give a columella without creases.

The composite free graft presents an infinite variety of applications. Among these is the reconstruction of the congenital deformity described above. Other methods, such as that in which the philtrum is used to form a columella, leave much to be desired. Here the result is a long narrow upper lip with a midline scar. In a male this will add further difficulty in adult life by growing hair.

SUMMARY

The use of the composite free graft has been demonstrated in two cases. The term has been defined to include all types of free grafts which contain tissue of more than one germ layer. The advantages and disadvantages of both types of

grafts have been enumerated and a suggestion has been made for the use of this type graft in repairing a congenitally short or absent columella.

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ONE-STAGE EAR LOBE RECONSTRUCTION

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Heretofore in plastic surgery literature, reconstruction of the ear lobe has involved multiple stage operations   The procedure followed in this case presentation involves a satisfactory reconstruction of an ear lobe in one stage   This method admittedly was hit upon at the operating table when it came to the reconstruction of the lobe of an ear which had to be removed because of a pigmented nevus   The principle of the method involves the great elasticity present in the post auricular skin and the free movability which can be obtained from the skin with wide undermining   It so happens that in this patient it was possible to leave some of the subcutaneous fat of the ear lobe as a base to roll the skin around   However, it would seem feasible to take a hinged pedicle of fat from the section just anterior to the ear lobe to use as a base to roll the skin around in the event that all of the fat of the ear lobe had to be removed, i e , with completely scarred ear lobe or tumor extending through the entire thickness of the lobe

This patient, a white female aged thirty three, was first seen on January 8, 1948, at which time an examination revealed a pigmented mole covering the entire left ear lobe   This mole enlarged the left ear lobe to such an extent that it was approximately three times larger than that of the right ear   She was extremely self-conscious about this growth and wished to have it removed   The patient was admitted to Mount Sinai Hospital, Milwaukee, Wisconsin, on January 18, 1948, and surgery was performed that same day under local anesthesia

SURGICAL TECHNIQUE

The pigmented mole covering the anterior and posterior aspect of the lower third of the left ear was dissected off leaving only the fat and cartilage of this portion of the ear   The skin of the remaining post-auricular region both on the posterior aspect of the ear and on the mastoid region extending down into the neck was widely undermined   Hemostasis was accomplished with gauze pressure for five minutes and the larger bleeders were tied off with #000 catgut One through and through opening in the remaining fat of the ear lobe, which was caused by removal of a portion of the mole which extended through the entire thickness of this area, was closed with an interrupted #000 catgut suture   The protruding rim of the cartilage of the lower concha was truncated down to decrease the size of the antitragus   This cartilage was covered with a small hinged fat pedicle from just below this area   The pedicle was sutured into position over the rim of the cartilage with a continuous #000 catgut suture   It was then determined that the undermined skin of the posterior neck was sufficiently elastic and could be moved to cover all of the denuded area of the ear without

grafts have been enumerated and a suggestion has been made for the use of this type graft in repairing a congenitally short or absent columella.

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Heretofore in plastic surgery literature, reconstruction of the ear lobe has involved multiple stage operations. The procedure followed in this case presentation involves a satisfactory reconstruction of an ear lobe in one stage. This method admittedly was hit upon at the operating table when it came to the reconstruction of the lobe of an ear which had to be removed because of a pigmented nevus. The principle of the method involves the great elasticity present in the post-auricular skin and the free movability which can be obtained from the skin with wide undermining. It so happens that in this patient it was possible to leave some of the subcutaneous fat of the ear lobe as a base to roll the skin around. However, it would seem feasible to take a hinged pedicle of fat from the section just anterior to the ear lobe to use as a base to roll the skin around in the event that all of the fat of the ear lobe had to be removed, i.e., with completely scarred ear lobe or tumor extending through the entire thickness of the lobe.

This patient, a white female aged thirty-three, was first seen on January 8, 1948, at which time an examination revealed a pigmented mole covering the entire left ear lobe. This mole enlarged the left ear lobe to such an extent that it was approximately three times larger than that of the right ear. She was extremely self-conscious about this growth and wished to have it removed. The patient was admitted to Mount Sinai Hospital, Milwaukee, Wisconsin, on January 18, 1948, and surgery was performed that same day under local anesthesia.

SURGICAL TECHNIQUE

The pigmented mole covering the anterior and posterior aspect of the lower third of the left ear was dissected off leaving only the fat and cartilage of this portion of the ear. The skin of the remaining post-auricular region both on the posterior aspect of the ear and on the mastoid region extending down into the neck was widely undermined. Hemostasis was accomplished with gauze pressure for five minutes and the larger bleeders were tied off with #000 catgut. One through and through opening in the remaining fat of the ear lobe, which was caused by removal of a portion of the mole which extended through the entire thickness of this area, was closed with an interrupted #000 catgut suture. The protruding rim of the cartilage of the lower concha was trimmed down to decrease the size of the antitragus. This cartilage was covered with a small hinged fat pedicle from just below this area. The pedicle was sutured into position over the rim of the cartilage with a continuous #000 catgut suture. It was then determined that the undermined skin of the posterior neck was sufficiently elastic and could be moved to cover all of the denuded area of the ear without

lue tension.   With this skin brought up in a high enough position so that it
ild be sutured to the lower concha, the ear lobe was fixed into the desired posi-
n by means of a mattress $\#$00000 silk worm gut suture at the proper level.
e skin was then folded around the fat of the lower third of the ear.   Two small
ls of fine mesh gauze were used, one on the anterior and one on the posterior
ect of the reconstructed ear lobe in order to hold the shape of this structure.
ese were fixed into position with through and through $\#$00000 silk worm gut
ttress sutures.   The skin flap was trimmed with a small scissors and sutured
the edges of the skin at the top level of the mole dissection with interrupted
)0000 silk worm gut suture (Fig. 1).   A single thickness of fine mesh gauze

FIG. 1. Photograph taken just prior to removal of sutures, showing line of sutures and
aze rolls.

s placed over these suture lines and a gauze turban-type pressure dressing
s placed over this.

POST-OPERATIVE CARE

The patient was placed on penicillin, 25,000 units every three hours intra-
uscularly day and night for forty-eight hours to prevent infection.   She re-
ired no post-operative medication for pain.   Initial dressing was done on the
cond post-operative day at which time it was found that the skin color was
od and the ear was healing well.   She was discharged from the hospital on
nuary 21, 1948.
She was followed as an out-patient in the office, where the first dressing was
ne on January 22, 1948, at which time the anterior fine mesh gauze roll was
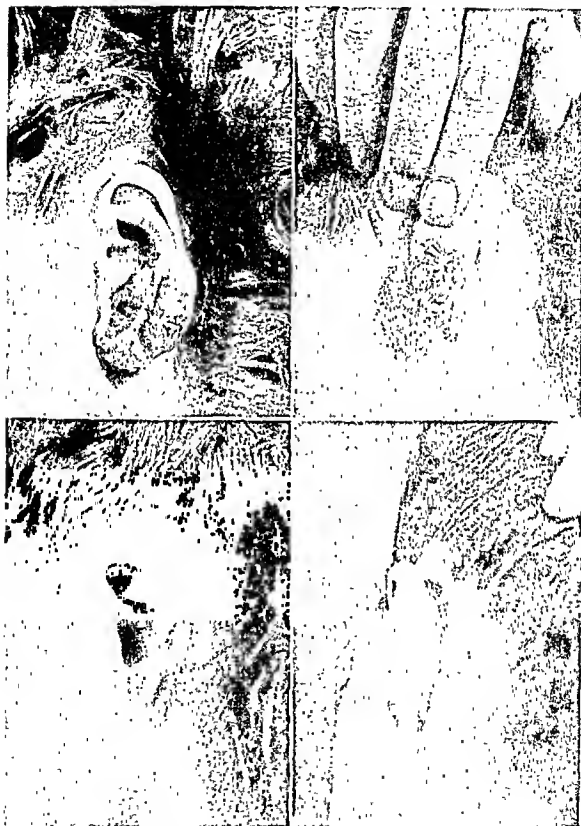
FIG. 2. PRE-OPERATIVE AND POST-OPERATIVE VIEWS

loosened by clipping the mattress suture as there was some cyanosis in the flap distal to this area. The second dressing was done on January 24, 1948, at which time all of the sutures were removed and it was found that healing was progressing satisfactorily. Photographs were taken at this time to show the appearance

of the ear at this stage, and the method of suturing used.   She was dressed again on January 26, 1948, and it was found that healing had progressed enough so that a smaller dressing could be applied.   By February 15, 1948, healing had progressed well enough so that all dressings could be removed.   The patient returned for a check-up on February 21, 1948.   Healing was satisfactory and the post-operative photographs illustrated were taken.   (See Fig. 2.)   Since this time the reddened areas and scar lines have whitened to blend in more satisfactorily with the surrounding skin.

PATHOLOGIC REPORT

The pathologist, Dr. Norbert Enzer, reported that malignant changes had started to take place within the epithelium of the most dependent portion of the removed pigmented nevus.   Serial sections revealed that the entire involved area had been removed.

SUMMARY

There are many and varied ways of approach to the reconstruction of ear lobes. The method presented here to my knowledge is original, and appears as though it might be useful for reconstructions in chosen cases of ear-lobe deformity. Only time and the trial of this procedure by others will determine whether or not it is added to the armamentarium of the reconstructive surgeon.

KLIPPEL-FEIL SYNDROME

Review of the Literature and Report of a Case

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AND

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Dike (1) reports that the first description of this syndrome was made by Willet and Walsham in 1887. A thorough search has been made for the reports of these two authors: we have been unable to confirm this first report thru any literature. In 1912 Klippel and Feil (2, 3, 4) made the first report on this disease; in 1919 Feil completed the first cases and reported them in a thesis. There is very little medical literature on congenital malformations of the cervical vertebrae (5, 6, 7). Up to the year 1932 there are only 30 reported cases, the majority mentioned in French literature; three in American and one in British literature. Two years later an additional 30 cases were reported, making a total of 60 cases in all. To date we have discovered approximately 100 cases.

The syndrome is fundamentally characterized by

a) Absence or shortening of the neck.

b) Limitation of the motion of the head, specially the lateral movements

c) Low hair line.

On X-Ray examination there is a fusion of all or several cervical segments. The number of vertebrae may be decreased, fusion of the spinal apophyses and irregular formations of the lateral apophyses may be present. The vertebral arches may not have fused, which produces a spina bifida in one section or involve the entire cervical spine.

The most frequent associated disorders and deformities are: cervical ribs, costal fusion, fusion of the scapula with the vertebrae, fusion of the Atlas to the Occipital bone, fusion of the entire cervical spine, occult spina bifida fusions of the entire dorsal segments. Persistent contracture of the cervical muscles, high scapuli (Sprengels deformity), defects of the shoulder and upper extremities, micrognatia (9), hydrocephalus (10), strabismus (11), cleft palate (12), pulmonary stenosis (13), torticolis, facial assymetry, dorsal scoliosis, dyspnea nad dysphagia, xifosis, idiocy and mental disturbances (14), skin lesions of Recklinghausen's disease (15), hypertrophy of the thymus and congenital heart disease (17), giant spinal apophyses (18), siringomyelia (19), oxicephaly (20), absence of apophyses (our case).

It seems that the etiology may be due to displastic factors, that inhibit the condrogenic centres of the vertebrae, Feil supposes that it is originally due to a high spina bifida causing pressure and trauma producing the fusion and malformation. Alcoholism has been also mentioned as a factor causing the syndrome; other secondary causes which are said to play a roll are obstetric trauma, inflammation of the uterus, and the irregular segmentation of the spine during the

first weeks of intrauterine existence. Even if there is no one sided opinion regarding the ethiology, the authors seem to be in accord that the malformation begins early in fetal life.

Gilmour (21) finds a higher incidence in females than in males,—and reports 34 women against 18 men in a series of 52 cases.

Jarcho and Levin (22) did not find any abnormality of the medulla after the autopsy of a case of Klippel-Feil Syndrome. On the other hand, Avery and Rentfro (23) found that some parts of the medulla had a deep anterior fissure, dividing it almost into two sections; these findings were present in the higher portions of the medulla. In the lower part they describe two fissures, which on occasions seems to reduplicate the central canal, with moderate gliosis.

The diagnosis is not difficult to make, if one bears in mind the possibility. The webbing of the neck, shows a similar aspect of the facial-cervical expression, with the difference that this latter does not present any bone changes. Some authors have taken it for a Suboccipital Pott's DISEASE (24). The X-Ray pictures will give a definite answer to the question of bone involvement. Blood chemistry is normal.

In the literature we did not find any reference regarding treatment; however Willard and Nicholson (6) mention that the motility improves with gymnastic exercises. We tried to see whether we could obtain some mechanical and mental improvement with plastic surgery, but after discussion it was decided that the results did not warrant the magnitude of the surgical procedure.

CASE REPORT

D. O. V. a 15 year old white female was first seen on January 17, 1948. She was brought to the Clinic for medical advice, complaining of reduction of movability, and a short webbed neck.

Her condition seemed to be congenital, as it was noticed after birth. The parents wanted to put earrings on her and noticed that both her ears were too close to her chest making it practically impossible, also noticeable was her inability to raise her upper extremities to any great extent. It is impossible for her to produce any lateral or circumduction movements and her anterio-posterior movements are quite limited.

On physical examination she does not give the impression of being as old as she is reported to be. The sternal region seems to be continued on the neck, which has a marked webbing. Posteriorly her neck has a length of 1 inch, with a very low hair-line, at the same level of of the scapuli. The neck circumference is 14 inches; her standing height is 127 cm., height at sitting position 45 cm., and her weight is 74 lbs. All these measurements are below average for her age. There are two soft masses at the level of the hair line one of 2½ cm. diameter, in the middle line, about 2 cm. below the occipital bone; there is only very fine hair growing on this mass. Underneath this, there is a smaller mass which is separated from the larger one by a scar, which probably corresponds to an orifice, that had a white secretion in the earlier years of life. Both masses are painful on pressure. The rest of the physical examination was normal.

The laboratory did not show any important findings. A complete blood count showed 4.5 million R.B.C. with 90% Hgb., and 9.920 W.B.C. with a normal differential. There was a doubtful Wassermann, which repeated later gave a negative result. Urine was normal. Blood sugar fasting, was 100 mg.%, urea nitrogen 22 mg.%. Calcium 6.5 mg.%., Creatinine 1.2 mg.%. The Basal metabolism was—15.

X-rays showed a fusion of all the osseous elements of the cervical spine, producing a rigid column. There is a spina bifida, which can be seen involving almost the entire cervical

spine Both scapuli are high, their upper border being at the level of the lower part of the lower part of the occiput (Sprengels deformity)

Fig 1

The patient has always been healthy At the age of eight she entered school, passing through grammar grades with a mentality equal to her classmates Apparently her deformity doesn't disturb her in the least and her behavior amongst people is completely normal of a child that age

During all the procedures of the examination she did not show any mental reaction of disturbance.   Yet when asked her opinion of possible plastic surgery to correct this afflic-tion, she expressed herself to be desirous of risking anything to eliminate this disorder. As said before, after lengthy discussion it was agreed upon not to employ surgery due to the fact little success could be expected from it.

Family Past History

Father is diabetic.   The rest of the family including two sisters are healthy.

SUMMARY

A case of Klippel-Feil Syndrome is presented, with review of literature, men-tioning the possibility of plastic correction.

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BOOK REVIEWS

The third edition of "Fractures of the Jaws," co-authored by Robert H. Ivy, M.D., D.D.S., F.A.C.S., and Lawrence Curtis, M.D., D.D.S., F.A.C.S. (published by Lea & Febiger, Philadelphia, 1945) is one of the most concise handbooks extant on maxillo-facial surgery, and one which I take particular pleasure in reviewing.

As the present editor of the Journal of the American Society of Plastic and Reconstructive Surgery, Inc., Dr. Ivy requires little or no introduction to fellow members in the Society. A few words concerning his medical career may be of interest, however, to the reader at large.

At the University of Pennsylvania, Dr. Ivy occupies the chair of professor of plastic surgery, School of Medicine and Graduate School of Medicine, and of maxillo-facial surgery, School of Dentistry. He is chief of plastic surgery, Graduate Hospital; and consultant in plastic surgery, Presbyterian and Children's Hospitals, Philadelphia. In World War I he was in active combat duty. During World War II he served in an important advisory capacity as a colonel in the Medical Officers Reserve Corps, U. S. Army. From the vantage point of his years of experience in the field of maxillo-facial surgery, he is exceptionally well qualified to speak with authority on the subject of fractures of the jaws and their complications.

Similarly, co-author Dr. Lawrence Curtis has a sound background in maxillo-facial surgery, rounded out by years of practical application. Currently, he is associate professor of plastic surgery, Graduate School of Medicine, and professor of clinical maxillo-facial surgery, School of Dentistry, at the University of Pennsylvania. Many practitioners, particularly reconstructive surgeons, are familiar with Dr. Curtis by virtue of the superior surgical dressing for burns which he has developed recently.

Together, Dr. Ivy and Dr. Curtis have produced an astute "how-to-do-it" manual, equally useful to the surgeon, the specialist, and the dentist, on the proper management of fractures of the mandible, the maxilla, the malar bone, and zygomatic arch. All of the techniques suggested have been employed successfully by the authors over a period of many years.

In this latest revision of their original text, Dr. Ivy and Dr. Curtis have made several notable inclusions, embracing new methods and material. Dr. LeRoy M. Ennis has contributed a chapter on extra-oral and intra-oral roentgenographic technique. Dr. Clyde W. Scogin has written a section on dietary management in fractures of the jaws. The book is illustrated throughout with numerous fine photographs and pen-and-ink sketches, which greatly further the reader's understanding of recommended procedures.

As the authors pointed out in their preface to the first edition of this work, which came off the presses in 1938, "The haphazard way in which these (jaw) fractures are frequently handled at present is often a cause of permanent crippling of the function of the jaw, unless correction is undertaken by measures requiring many additional months of treatment." To obviate such unfortunate results, the book emphasizes methods which can be set into motion immediately by the surgeon, the oral surgical specialist, or the dentist, without recourse to narrowly defined dental laboratory techniques, to the end that little time need be lost in reduction and fixation of the fragments.

Dr. Ivy and Dr. Curtis are to be complimented on their revision of an already excellent manuscript, devoid alike of verbosity or any but the most carefully proved procedures. Wherever the ubiquitous jaw fracture presents its complications, the doctor or surgeon in charge will find this a most dependable reference book to call into consultation.—Reviewed by Clarence R. Straatsma, M.D.

SHOCK

Snyder, Howard E: Replacement of Blood in Management of Wounds. *J. A. M. A.*, 133; 219, Jan. 25, 1947.

In an experience of dealing with more than 500 cases terminating in death from shock in the Mediterranean war theatre, Snyder concludes that the loss of whole blood rather than that of plasma is the cause of reduced blood volume in most wounded with shock. The need for blood replacement in some patients was so urgent that as much as 1000 c c. of "O" blood were given in ten minutes. (He added that all blood to be given after the first 1000 c.c. must be cross-matched.)

Snyder believes that low titre "O" blood should be available for use in emergencies which occur with severe wounds or because of unexpected bleeding at the operating table.

Stewart, John D.: Wound Shock. *J. A. M. A.*, 133: 216, Jan. 25, 1947.

In a study of a series of battle casualties with wound shock due to severe trauma, not including burns, Stewart came to the conclusion that loss of blood is the dominant etiological factor. He believes that the characteristic feature of traumatic shock is the lability of the state and the rapidity with which improvement or decline may take place. Reduced blood pressure and oligemia, however, were found to be "reasonably" constant measurable factors.

Stewart warns that the injection of plasma

will raise the blood volume but only at the price of further diluted circulating hemoglobin and increased tissue anoxia.

He reminds us that surgical intervention should not always be postponed, for blood and oxygen therapy can be continued during operation. Shock treatment and surgical operation must not be set apart as two separate problems.

BURNS AND WOUNDS

Langohr, J. L., Owen, C. R., and Cope, O.: Bacteriologic Study of Burn Wounds. *Ann. Surg. 125:* 452, Apr. 1947.

The effects of the systemic administration of penicillin and sulfadiazine on the bacterial flora of a series of full-thickness burns were studied by Langohr, Owen and Cope. Penicillin in massive doses is effective in reducing the number of beta hemolytic streptococci, because this type of organism is unable to alter its metabolism to resist penicillin. The alpha and gamma types, however, rapidly develop a resistance and multiply and spread in such a way that sulfadiazine should be tried in the hope of checking these particular types. Penicillin is effective in preventing actual tissue invasion by staphylococci, but resistance to penicillin is so rapidly developed by staphylococcal strains that the effective therapeutic period of the drug is sharply limited to the first three weeks. Since clostridia resist chemotherapy, it is suggested that the giving of antitoxins be considered together with prompt excision of slough in instances of burns of the lower extremity.

Sulzberger, Marion B., Kanof, Abram, and Baer, Rudolf, L.: Acid Débridement of Burns. *Ann. Surg. 125:* 418, Apr. 1947.

The pyruvic-acid starch-paste method of slough removal in burns was compared by Sulzberger and his coworkers with other acids. They believe that acid débridement is dependent on the maintenance of a correct supply of hydrogen ions over a sufficient period of time and not on any specific cation of pyruvic acid. They found that phosphoric acid was less irritating than pyruvic acid and just as effective in removing slough; they suggest its use in the form of a dry hygroscopic powder sprinkled on the burn area, and the addition of proper amounts of water to form a suitable gel.

Connor, G. J., and Harvey S. C.: The Pyruvic Acid Method in Deep Clinical Burns. *Ann. Surg. 124:* 799, Nov. 1946.

The separation of slough in third degree burns was found by Connor and Harvey to be "exceedingly" hastened if the pH on the surface of the wound is sufficiently lowered. Pyruvic acid mixed with starch paste was perceived to bring about this lowering of the pH satisfactorily. By the pyruvic acid method a series of deep burns were prepared for grafting in periods of time as short as ten to twelve days.

Lyons, Champ: Chemotherapy in the Management of Wounds. *J. A. M. A. 133:* 215, Jan. 25, 1947.

In a study of infected wounds Lyons concludes that local chemotherapy is both unnecessary and undesirable, the "local trauma" incident to such therapy doing more harm than good. Suppuration of a wound is due more to the presence of a pabulum of wound protein than to any specific bacterial virulence, and is an indication for repeated surgical toilet of the wound. Penicillin administered systemically is the chemotherapeutic agent of choice in the management of wounds. Sulfanilamide is adequate only for the wound endangered by the presence of hemolytic streptococci.

GRAFTING

Bors, Ernest, and Comarr, A. Estin: The Buried Epidermis Graft. *Surg. Gynec. Obst. 87:* 68, July, 1948.

This paper by Bors and Comarr attempts to revive an interest in the "Implantation Method of Skin Grafting" reported by Wangensteen in 1930. Here it has been used in the treatment of bedsores in patients suffering from paraplegia and is often recommended for treatment of ulcers of the heel, ankle and knee cap.

The purpose of the grafting was twofold: first, to achieve permanent closure of the ulcer and second, to provide temporary epithelization in order to restrict the loss of proteins until a permanent plastic flap procedure could be attempted.

The technic consists of taking a thin Thiersch graft in one piece and dividing it into small squares of 0.3 by 0.3 cm. The grafts are introduced into a preformed bed where they are retained after withdrawal of

the instrument   The grafts are placed 1 to 1.5 cm apart   At the end of the first and at the beginning of the second week, grayish islands of epithelium appear at the site of the seeds   The patches coalesce rapidly and the granulation tissues retract   If barren spaces are left, regrafting can be attempted at any stage after the first 10 days

The authors concur with Wangensteen's statement that the "cosmetic result has been above criticism"   The chief advantages are simplicity of method, the great percentage of "takes," resistance to infection and thriftiness of the method in regard to the donor area

The investigators feel that the advantages more than outweigh the criticism that the cosmetic results are inferior and that the quality of the resulting skin is inferior to that obtained with plastic flap procedures They consider that in all cases of decubitus ulcer where free skin grafting appears to be indicated, the "buried epidermis" graft is far superior to any other type of free skin graft

Barker, Donald E   Homotransplantation of Fetal Skin   *Arch Path* **44** 166, Aug 1947

In a study of the status of homotransplantation of fetal and adult skin, Barker concluded that in the guinea pig the grafting of skin tissue from a fetus is no more success ful than that from an adult

Owens, Neal · Reevaluation of the Implantation of Fascial Strips through the Masseter Muscle for Surgical Correction of Facial Paralysis   *Ann Otol Rhin & Laryng* **57** 55, Mar 1948

Owens adds 3 additional cases to his original presentation of the implantation of fascial strips for surgical correction of facial paralysis and reevaluates his original work He is of the opinion that the direct attachment of the muscle fasciculi to the paralyzed muscles offers a less satisfactory result than the use of fascial strips which connect the masseter muscle to the paralyzed one

The utilization of fascial strips attached directly to an intact muscle which has normal innervation, and carried to the paralyzed muscles, furnishes a supportive sling that gives an additional quality of movement when voluntary contraction of the normal

muscle occurs   The masseter muscle, innervated by the trigeminal nerve and firmly attached to the zygomatic arch by a strong tendinous attachment and to almost the entire ramus of the mandible, is particularly well suited for this purpose

Owens uses fascia lata obtained from the thigh either by employing a vein stripper or by direct excision   Submandibular incision is considered preferable to an incision over the masseter muscle, because of the better cosmetic result obtained from the former and also because of the opportunity afforded for facial extension of the incision anterior to the ear for increased exposure or the utilization of the temporal muscle

The extent of overcorrection is difficult to estimate but such tension as will draw the mouth backward approximately 2 5 cm is about correct

The author feels that this procedure offers much to those afflicted with facial paralysis, regardless of the etiology, when three years have elapsed since the transection of the nerve, when direct nerve anastomosis is not feasible, when the substitution of the spinal accessory or the hypoglossal nerve by anastomosis is not possible or is undesirable because of the results of paralysis of the shoulder or tongue muscles, or when a nerve anastomosis has been attempted previously and failed

Martin, Bruce C.: The Use of Cancellous Bone Grafts for Small Defects of the Skull and Brow Region   *Surgery* **25** 103, July, 1948

A series of 5 cases in which cancellous bone has been used is presented by Martin   In one in which the calvarium proper was involved, there were three defects of the skull and brow, and in one there were defects of the brow and nose

The author obtains his cancellous bone from the iliac crest   After removing it he cuts it into small triangles after the method described by Mowlen, and he feels that he secures a proper contour   He is of the opinion that cancellous bone is readily adaptable to repair of small defect of the skull especially in the brow region, where it is difficult to contour any foreign material such as tantalum or acrylic resin   In view of the superior resistance of cancellous bone to infection, which is always a hazard when one

is working near the nasal sinuses, he believes it to be markedly superior to any foreign material no matter how inert.

Sehjelderup, Halfdan: Treatment of Skin Avulsion Injuries of the Limbs. *Acta chir. Scandinav. 96:* 109, 1947.

The mechanisms causing avulsion of the skin are described by Sehjelderup. The causes of necrosis of the avulsed skin flap are discussed; they are considered ultimately causes of circulatory disturbances. The pathological development and way of healing taking place in untreated patients are described. The final result is either a skin surface covered by thin scar epithelium liable to constant breaking down or the case is complicated by joint contractures due to shrinking scar tissue. These disabilities may also occur combined. It is emphasized that treatment must aim at restoring skin continuity as quickly as possible to prevent formation of massive scar tissue, with subsequent shrinking resulting in contractures of neighboring joints. Infection from the raw area must also be prevented. Replacement of the avulsed skin as a whole thickness skin flap should be abolished entirely, because of the high percentage of failure by necrosis of the skin.

Exposed bone or tendons must be covered either by local tissue before skin grafting or by full thickness pedicle graft. Principles for treatment of previously untreated patients are given. Joint contractures offer absolute indication for plastic repair, while unstable scarring offers a relative indication. Case records with individual comments are included in the article.

Brown, J. B., et al.: Surgical Substitutions for Losses of the External Ear: Simplified Local Flap Method of Reconstruction. *Surg. Gyn., and Obst., 84:* 192–196 (Feb.) 1947.

Rapid and simple restoration of complete and incomplete losses of the external ear is important because of the frequency of occurrence of such defects.

A fundamental plan can be used if freshening whatever is left of the stump of the ear and implanting it carefully under a scalp flap behind and above the ear. After two to three weeks an adequate amount of

costal cartilage is put in under the scalp flap in the desired shape. In another three to four weeks the flap and cartilage are dissected free of the skull so as to leave soft tissue attached to the under surface of the cartilage and to the skull. The resultant double raw surface is grafted with a single large thick split graft. Later adjustment may be necessary. A tubed flap from the neck can be used if necessary to provide additional helix.

Helix losses can thus be repaired in two operations and total ear reconstructions can be done in as little as three operations. The restorations are recognized as substitutions and not duplications of normal ears. An exact general outline and prominence may at least fail to attract notice.

Preserved costal cartilage is usually used and is secured from fresh autopsy material. It is carved in the operating room to a suitable shape. If the hairless skin around the ear is scarred or limited it may be necessary to replace it with free grafts. If there has been an avulsion of local tissues, local flaps may be needed. Ears crumpled from chondritis may require excision of the deformed cartilage first.

Partial losses of helix and pinna can be repaired simply and rapidly and may not require cartilage support. Sensation is usually slow in developing. Complete free grafts from the opposite ear may be considered for small losses of the ear.

Note: The excellent illustrations accompanying this article will be of interest to those engaged in this type of surgery.

EAR AND EYE

Conway, H., Neumann, C. G., Gelb, J., Leveridge, L. L., and Joseph, J. M.: Reconstruction of the External Ear. *Ann. Surg. 128:* 266, Aug. 1948.

An excellent survey of the literature concerned with reconstruction of the external ear is presented by Conway and his associates. They also give a concise summary of the salient features in the development of present-day methods of repair of such defects. The technics most commonly used in the light of their experience are evaluated.

Refinements in methods of carving and removing costal cartilage are presented, along with good illustrations to clarify these

comments   Ten cases are then reported in which partial or complete reconstruction of the external ear has been carried out   The majority of the reconstructions were effected by the use of free costal cartilage grafts buried under temporal skin flaps, followed by their elevation and backing by a free split skin graft at a second operation   In some cases a small tubed pedicle was utilized to reconstruct a new helix   In one case a subtotal reconstruction was successfully completed, tantalum mesh being used as a supporting framework

The opinion is advanced that a reconstruction of the external ear can be achieved which is satisfactory to patient and surgeon alike if the fundamental details of technic as described here in part are observed and mastered

Foucar, H. O.: Pterygium Colli and Allied Conditions. *Canad M A J 59* 251, Sept 1948

In a case of pterygium colli, Foucar corrected the condition by means of a central line incision posteriorly with two incisions running out from this as in a "T"   Each flap of skin was undermined, and excess skin was excised   It is claimed that both folds were corrected through the one operative field by this method

Editorial Comment A lateral picture of only the post operative condition is shown   The article deals rather fully with the previous literature on the subject and is well worth reviewing on this account

JAW

Byars, Louis T.: Preservation and Restoration of Mandibular Function and Contour   *Ann Surg 127* 863, May, 1948

Byars states that mandibular function and contour are often jeopardized by operations, trauma or infection   Limitation of mouth opening may be due to temporary inelasticity of soft tissues as a result of inflammation, or a permanent fixation with true or false ankylosis of the temporomandibular joint   In cases resulting from extensive trauma, frequently the coronoid process is anchored to the zygoma   Resection of the temporo mandibular joint, including the coronoid process, will give relief   Adequate removal of bone at the site of resection is more im

portant than application of some substance between the resected ends   This resection is commonly done from in front of the ear, reflecting the parotid gland and facial nerves forward and downward   In simple conditions it may be approached through the mouth   In the most difficult cases with a broad thick mass of bone and a short ramus the approach is made from the neck, the soft structures being elevated and the ramus being resected above the angle, including the condyla and coronoid process   Such resection causes very little dysfunction, except to diminish the power of the bite, and does not disturb dental occlusion

Firm fixation in a closed position may be caused by subsurface scarring between the coronoid process and zygomatic arch   This fixation is released by adequate resection of the coronoid process from within the mouth

False ankylosis often follows depletion of soft tissues connecting the jaws   At the time of an injury or secondary operation all possible soft tissue must be preserved

Removal of a section of the mandible creates an immediate problem in management of the remaining fragments   If they are not held in proper relationship, muscle pull may displace the fragments medially and backward, shutting off the airway and making swallowing both painful and difficult.   At the time of resection an accurate and careful soft tissue closure must be made   The simplest scheme for control of bone fragments is to wire the teeth of the fragments to their corresponding maxillary teeth   In the edentulous patient or in children, this method not being available, the use of arch bars, open bite splints, internal bar fixation, *et cetera* is described

In patients with traumatic loss of bone under adverse circumstances, fixation may be accomplished by insertion of a bar of tantalum or stainless steel between the ends of the bone   Such fixation has been maintained for several months and in some instances, for years   After removal of half the mandible and disarticulation, or after resection at the symphysis and high on the ramus, a rib with its attached cartilage is used as a graft, the technic for which is described by Byars   The drilling of a threaded stainless steel bar into the symphysis and the impale-

ment of the rib on the bar, bent to the line of replacement, give firm and adequate immediate fixation until bony union to the symphysis has occurred.

Occasionally in dealing with tumors such as adamantinomas, ossifying fibromas or osteomas which have caused extreme expansion of the bone without involvement of the periosteum, the entire thickness of the bone is removed leaving at least portions of the periosteum bridging the gap between the ends; regeneration will occur following this type of subperiosteal resection.

Resulting asymmetry and disfiguring irregularities of contour are corrected by the prominence of the mandible on the flattened side, preceded by pedicle graft if soft issue is not adequate to cover the graft.

Obliteration of the buccal sulcus is corrected by incision in the buccal sulcus and the application of split thickness graft.

Pre- and postoperative photographs are shown to illustrate results of described procedures.

Ragnell, A.: Correction of Some Jaw Deformities. *Acta. chir. Scandinav. 88:* 344, 1943.

A short description of the methods of operative treatment used in the correction of abnormalities of the jaws is given by Ragnell. He divides the abnormalities into the following groups: prognati—prominent upper jaw; progeni—prominent lower jaw; opistognati—receding upper jaw, and opistogni—receding lower jaw.

The first two abnormalities are corrected by an osteotomy of the ramus ascendens of the mandible and by moving the jaw forward or backward as necessary to correct the bite. For the third abnormality Ragnell points out the astonishing effect of a bone graft in the nose for lifting forwards the middle part of the face. In more extreme cases the nasal-buccal-inlay (Esser-Gillies) has been used.

With a receding jaw but a correct bite, opistogni has been corrected by a free bone graft to the point of the chin. For this condition with a receding bite an osteotomy of the ramus with a pushing forward of the mandible has been done.

To these four abnormalities the author adds asymmetry in a more irregular group

of patients chiefly with displacement of the jaw to either side. In these cases rotation has been necessary at the osteotomy on one side and a sliding on the other. More complicated disfigurements of the face, such as "dishface" in secondary harelip cases, or "birdface" with asymmetry have demanded a combination of several plastic procedures.

MISCELLANIES

Couch, J. H.: Psychology of Reconstructive Surgery. *Canad. M.A.J. 59:* 10, July, 1948.

As pointed out by Couch, the surgeon who occupies himself with plastic and reconstructive surgery should not only be an expert in his art but should also have a good understanding of the psychology of patients with disfiguring and disabling traumatic lesion.

The author recommends that the patient be prepared for the reaction of the public to disability, that there should be some education of the public to the fact that scars might be regarded with envy and with admiration. Scars obtained in honest toil or in battle for a righteous cause are not dishonorable.

The ministrations of the plastic surgeon must succeed not only surgically but psychologically. The surgeon must ever be able to support his patient until the thinking and feeling of society he moulded to the point where scars of the body, even though not exalted as necessary emblems of valor, are at least regarded in their proper perspective and are seen to be of little importance in the structure of the real personality.

Nevius, William B.: What Is the Cause of Congenital Malformations? *J. M. S. New Jersey 45:* 289, June, 1948.

The incidence and causes of congenital deformities are discussed by Nevius. He states that the adjusted incidence of congenital defects among the general population is 47 per ten thousand births. Congenital defects are five times more common among the still-born than among the live-born.

Reports consistently indicate a relationship between rubella in the mother during the first three months of pregnancy and congenital malformations among the offspring. Important embryologic changes in the development of the eye, ear and heart occur

in the fetus at the time the mother is affected with rubella.

Experimentally when rats were fed on a diet deficient in Vitamin B complex, their offspring regularly showed short mandibles and short or absent radii, ulnae, tibiae and fibulae. The addition to the diet of 2 per cent dried pig liver, or riboflavin alone prevented these deformities. In rats the thirteenth, fourteenth and fifteenth days are the critical period for the possible development of malformed offspring.

The high incidence of deformed babies smong mothers who received radium therapy or roentgen irradiation during pregnancy is shown.

It is urged by the author that women receive adequate amounts of vitamin B complex (especially riboflavin) during pregnancy and that utmost care be exercised not to irradiate the pregnant uterus.

Nevius suggests that all girls between the ages of five and fifteen be deliberately exposed to rubella during an epidemic. In the case of a known exposure to German measles during the first three months of pregnancy, the intramuscular injection of 10 c. cm. of immune globulin will probably prevent the occurrence of the disease. Where the clinical disease develops, a therapeutic abortion is indicated following recovery.

Altemeier, W. A., and Wadsworth, C. L.: Penicillin—Its Use in Surgery and Influence on Earlier Types of Chemotherapy. *Surg. Gynec. Obst.* 84: 540, Apr. 15, 1947.

Following an extensive experience with the use of penicillin, Altemeier and Wadsworth conclude that penicillin is far superior to the sulfonamides in the treatment of infections caused by the staphylococcus. Furthermore, it has been particularly useful in the cases of infection caused by sulfonamide-resistant gonococci, hemolytic streptococci, and pneumococci. Penicillin is also the chemotherapeutic agent of choice in gas gangrene, rat-bito fever, actinomycosis, anaerobic streptococcal infections, and infections from a human bite.

Bowers, W. F.: Chlorophyll in Wound Healing and Suppurative Disease. *Am. J. Surg.* 75: 37, Jan. 1947.

The use of water-soluble derivatives of chlorophyll in a wide variety of wounds and diseases along with the plastic conditions of six patients are described by Bowers. The beneficial effects of chlorophyll on infected lesions are apparently due to a direct antibacterial action. In addition, it has a marked stimulating effect on granulation tissue. This latter action may be a disadvantage in some cases, while a great advantage in others.

THE SURGICAL REPAIR OF DECUBITUS ULCER IN PARAPLEGICS, FURTHER OBSERVATIONS[1]

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Improvements and refinements in the technique of decubitus ulcer repair have been evolving as the experience of surgeons in the various paraplegic centers has broadened The treatment of the paralyzed patient having bedsores has presented a difficult and challenging problem to the plastic surgeon, and to the neurosurgeon, urologist and orthopedic surgeon as well At a meeting of the American Association of Plastic Surgeons in Memphis during May, 1947, we presented a preliminary report of our early experience in handling problems of this type Subsequently, with increased experience, we have been able to formulate more definite ideas, and for this reason, wish to transmit our findings for the benefit of those who have not had the opportunity to deal with large numbers of paraplegic decubitus ulcers This presentation is intended to summarize the present status of decubitus ulcer surgery at the U S Veterans Administration Hospital, Hines, Illinois, and is based upon 334 operations for the closure of decubitus ulcers in paraplegics performed between January 1, 1947 and October 15, 1948

Excellent descriptions of the micropathology and etiology of bedsores may be found in the recent literature Suffice it to say that decubiti in paraplegics most commonly develop over the bony prominences of the pelvic girdle, notably 1) the convexity of the sacrum, 2) the great trochanter of the femur, and 3) the tuberosity of the ischium Two and three years ago, when patients in this category were in the majority bedridden, the incidence of sacral and trochanteric ulcers was much higher Now that most paraplegics are ambulatory, sitting in wheelchairs and automobiles several hours each day, the incidence of ischial decubiti has risen sharply Of the 334 operations reported herein, 178 were performed for closure of ischial ulcers, 90 for trochanteric, 60 for sacral, and 6 for ulcers elsewhere The repair of the ischial decubitus has therefore presented our greatest problem

The selection of candidates for surgery depends upon the patient's general condition and the extent to which the bedsore is free from any active infection Chloraquin ointment and solution have been used routinely with very satisfactory results in preparing infected ulcers for surgical repair The patients receive sulfasuxidine in 3 gm doses every 6 hours for one week prior to and following the

repair of ischial ulcers.   In all others Penicillin, 100,000 Units is given every 3 hours for one day before surgery and 10 days afterward, and paregoric, drams one twice daily for a similar period.   A transfusion of whole blood is given during the operation.

Generally speaking, a tendency has developed to become more radical in the excision of the decubitus ulcer and underlying bone.   It is futile to rotate a pedicle flap over a bony prominence which remains to reproduce the same mechanical pressure that created the original ulcer.   It is even more futile if the underlying bone is diseased.   In almost all decubitus ulcers of several months

TABLE I

Sacral decubitus repair

Of 60 operations performed on 39 sacral decubiti:

Delay of local pedicle flap	36.6%
Excision of ulcer, closure with local pedicle flap and split-thickness skin graft to donor area	15 0%
Simple excision of ulcer	15 0%
Split-thickness skin graft to ulcer	13.3%
Excision of ulcer and closure with S-Plasty	10.0%
Excision of ulcer and closure with sliding pedicle flap	6.6%
Revision of pedicle flap	1.6%
Evacuation of hematoma from beneath flap	1.6%

duration, the underlying bone is definitely diseased whereas in the more recent ulcers there may be little or not bone involvement.   Our pathology reports show:

Degeneration and/or fibrosis of bone	51.8%
Osteitis and/or osteomyelitis	24.1%
No disease of bone reported	24.1%

SACRAL DECUBITUS

The repair of sacral decubiti is best accomplished by the use of suitably designed local pedicle flaps utilized to fill the surgical defect created by extirpation of the ulcer and projecting bony spines.   A larger lumbar flap has proved particularly useful after it has been properly delayed, utilizing a split-thickness skin graft to cover the donor areas.   Split-thickness skin grafts have occasionally been applied directly to the ulcer as a temporary expedient.   For a tabulation see table I.   Complications have been very rare in this group.   All in this series are now healed (Figs. 1a, 1b).

TROCHANTERIC DECUBITUS

Characteristically trochanteric decubiti are widely undermined, the ulcer frequently breaking into the trochanteric bursa and following its outlines.   An extension of osteomyelitis of the great trochanter into the neck of the femur may occur, requiring resection of the upper third of the femur.   This has occurred in two instances.   In four there have been sinus tracts extending from the trochanteric decubitus into the hip joint.   The surgical repair has consisted of total

excision of the ulcer and its lining, amputation of the great trochanter, and closure by a properly selected local pedicle flap. Most commonly a local flap has been shifted from the anterior thigh and its donor area covered with a split skin graft. The S plasty is utilized in some instances where closure can be accomplished

Fig 1a Sacral decubitus—a lumbar local pedicle flap has been 'delayed'

Fig 1b After rotation of flap and covering donor site with split thickness skin graft

without any tension. In some cases single sliding flaps are used (Figs 2a, 2b)

Due to the extreme difficulty of immobilizing the legs of paraplegics after surgery, motion of the femur under the flap does occur and commonly causes

hematoma.   Therefore these repairs are dressed early and often, and any hema-
toma evacuated immediately   Wound disruptions, usually incomplete, may be
associated with the hematoma formation, especially when the patient has reflex

FIG 5 DISEASED ISCHII UNDERLYING BILATERAL ISCHIAL DECUBITI
There is bilateral ischial osteoporosis and osteomyelitis

FIG 6 BILATERAL ISCHIAL DECUBITI—PREOPERATIVE PHOTOGRAPH
Extensive undermining is present in the decubitus on the right

muscular spasm.   In general, patients with such spasm have proved very poor
candidates for any bedsore surgery.   Fortunately even wounds from which
hematomas are evacuated tend to heal without breaking down since the bony
prominences have been removed.   Three recent postoperative ulcers in this
group remain open

ISCHIAL DECUBITUS

The repair of ischial decubiti has followed two definite patterns, the second being more radical and evolved from the earlier procedure. We have become

FIG 7 RESECTION OF ISCHIAL TUBEROSITY OF PATIENT SHOWN IN FIG 6
Gigli saw is in position through the obturator foramen preparatory to excision of the projecting bone

FIG 8 WOUND CLOSURE WITHOUT TENSION IN PATIENT SHOWN IN FIGS 6 AND 7
The excision of bone has greatly simplified the closure of the wound

increasingly radical in our excision of bone in treating these lesions. Two years ago we began amputating a portion of the ischial tuberosity and then covering the defect with gluteal and biceps muscle flaps and a local rotation flap from the posterior surface of the thigh, covering the donor area with a split thickness

skin graft (Fig. 3a). The results were not satisfactory in all cases however, because a bony prominence remained as a potential hazard in the production of a new ulcer, and incomplete excision of diseased bone led to the recurrence of sinus

FIG. 9. BONE AND ULCER EXCISED FROM PATIENT SHOWN IN FIGS. 6, 7 AND 8

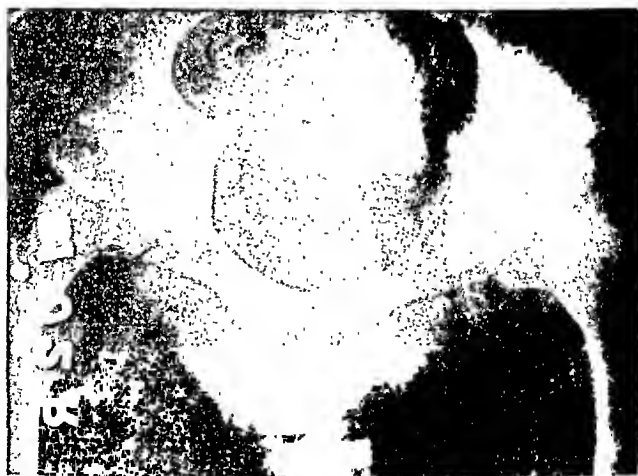FIG. 10. POSTOPERATIVE BILATERAL SUBTOTAL ISCHIECTOMY

tracts. In general the results of what we shall call "the old type" ischial closure may be judged from Table III.

A new and more radical method of treating ischial decubiti has proved simpler and more satisfactory (Fig. 4). After excision of the ulcer, Gigli saws are passed through the obturator foramen and a complete ostectomy of the ischial tuberosity

is performed.   The ischial rami are trimmed further with a Sauerbruch rongeur, the lateral excision continuing until the bony fulcrum supporting the obturator internus muscle has been removed. Bone bleeding is controlled with "Gelfoam". The obturator internus muscle is then fanned out and sutured over the lateral ramus to the obturator externus muscle and the cut origin of the biceps femoris muscle. It is then usually possible to close the wound by simple primary closure using local tissue to fill in the entire defect without the use of any flaps.

The sitting patient is now able to carry his body weight on bony prominences which are covered with a very ample padding of muscle, fat and skin and the necessity for the use of complicated muscle flaps is obviated. The patients who are able to walk on braces have shown no evidence of pelvic instability. Complications have been few and not serious. Healing time has markedly decreased. Of this group only 14% required an additional flap to effect a comfortable closure. Two ulcers in this group have recurred after repair.

TABLE IV

Ischial decubiti—new type repair

Of 97 operations performed on 85 ulcers	
Closed in one operation	88.2%
Closed in two operations	10.6%
Closed in three or more operations	1.2%

SUMMARY

An analysis of 334 operations for the repairs of the most common decubitus ulcers occurring in paraplegic patients has been presented. Methods utilized in the repair of sacral, trochanteric, and ischial decubiti have been discussed, and a new operation for the surgical closure of ischial decubiti described in detail.

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VASCULARIZATION OF TUBED PEDICLES[1]

HERBERT CONWAY, M.D., RICHARD B. STARK, M.D., AND JOHN P. DOCKTOR, M.D.

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In the employment of tubed pedicles in the reconstructive surgery of soft tissue the surgeon must make the decision in each case as to the earliest date upon which a tubed pedicle may be cut safely and transplanted successfully. This decision is based on clinical judgment as to the state of the circulation in the pedicle under observation. This clinical "trial and error" system usually is modified by caution, a factor which may cause undue delay in the transference of a pedicle. Excellent anatomical studies of the vascular bed in tubed pedicles have been made by German, Finesilver and Davis (1). Their studies included visualization of the vascular bed of tubed pedicles in experimental animals by the injection of toluidine blue, by the perfusion with a suspension of barium in gelatin and by histologic section. It was shown by them that new vascular channels are established by the seventh day after construction of a tubed pedicle and that there is little difference in the number or the size of these vascular channels between the seventh and the fourteenth day after construction. But the anatomical demonstration of the presence of continuous vascular channels in a tubed pedicle as early as one week after construction does not ensure that the pedicle has circulatory efficiency nor does it afford assurance that the tissue of a pedicle transplanted at such an early date will survive in its new location. The dissimilarity of practice of various surgeons suggests that a simple clinical test to determine the adequacy of circulation in tubed pedicles would be of value. The problem of the development of circulation in a tubed pedicle is not unlike that presented in the clinical management of patients with peripheral vascular disease of the extremities. The clinical tests used for the determination of the degree of impairment of circulation in diseased lower extremities well may be applied in evaluation of the degree of development of early circulation in tubed pedicles. McClure and Aldrich (2) described a test for the presence of subclinical edema. This consisted of the use of intradermal saline wheals with comparison of their resorption rates in normal and abnormal areas. Stern and Cohen (3) applied this test to the study of circulation in the lower extremities. Pioneering a new attack on this problem Brooks and Jostes (4) described the "temperature return test". This test measures (by thermocouple) the rate of return of temperature of the tissue of the extremity following the release of a tourniquet. Applying this test to tubed pedicles Douglas (5) determined the competency of early circulation by recording the rate of return of temperature to the subcutaneous tissues after release of tourniquets previously applied to the

Fig. 1. Photographs of Tubed Pedicle and of Control Areas to Show the Degree of Vascularity as Evidenced by the Brightness of the Fluorescence

As labeled above, the tubed pedicles were photographed 4 days, 9 days, 16 days and 24 days after construction. Tubed pedicles are on the right of the photographs; the control areas are on the left. Note that the 4 day tubed pedicle shows less fluorescence than the control area. The 9 day tubed pedicle shows fluorescence equivalent to the control area at either extremity of the pedicle but not in the middle. Both 16 and 24 day tubed pedicles show fluorescence which is more intense than that of the control areas.

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two ends of the pedicle.   Douglas and Bucholz (6) reported their observations on this test in experimental animals and in humans.   They also reported on the rate of return of systolic blood pressure and on the rate of return of growth of hair in tubed pedicles.   Douglas and Millikan (7) assayed the circulation of tubed pedicles by means of an oximeter in which a photoelectric register records changes in hue which are dependent upon flow of blood.   Dingwall and Lord (8) visualized the circulation in tubed pedicles by the use of intravenous sodium fluorescein as popularized by Lange (9).   Fluorescein carried in the blood stream gives a yellow color effect to the skin when viewed under ultraviolet light.   If the skin of a tubed pedicle showed uniform fluorescence while a tourniquet was in place at one end, the circulation of the pedicle through its open end was deemed to be adequate.

In our studies on experimental animals a number of these clinical tests have been used.   These have included the saline wheal test, the fluorescein test and a skin temperature-tourniquet test which is a modification of the temperature return test.   In addition, the vascular beds of tubed pedicles were visualized by x-ray after thorotrast injections, and histologic sections were made of pedicles on successive days after their construction.

The success or failure of surgical transplantation of one end of these tubed pedicles was the method of evaluation of the worth of the several clinical tests. The observations from these experimental and clinical tests are presented in an attempt to throw further light upon this interesting physiologic and pathologic problem, the practical solution of which should provide a mathematical formula for the management of tissue transplantation by pedicle.

OBSERVATIONS

Tubed pedicles were constructed over the dorsal thoracic area of rabbits Skin and subcutaneous tissue incorporated in these pedicles was twice as long as wide.   The absolute size of each pedicle was determined by the individual body weight of each experimental animal.   In an animal of two kilograms, the tubed pedicle was constructed from a surface area measuring 7.5 by 3.75 cm.   Observations on these pedicles were made just before their transplantation.   These included the recording of the rate of growth of hair on the pedicles, degree of induration of the pedicles, the rate of absorption of an intradermal saline wheal[2] and the fluorescein test.[3]   They are recorded in Table I which gives the age of each pedicle in days and the results following their division and transplantation. Success or failure following transplantation represents the index to the relative value of the several clinical tests.   Study of Table I shows that poor growth of hair on the pedicle and marked induration are evidence that circulatory adequacy has not been established; that nine days after construction this type of tubed

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[2] This test consists of the intradermal injection of physiological saline solution into both ends of the tubed pedicle and over a control area on the opposite side of the animal's body.   The rates of resorption of the wheals in the tubed pedicle are timed in comparison with that of the control area (adapted from Stern and Cohen).

[3] The fluorescein test consists of the intravenous injection of sterile solution (5%) of the soluble salt of fluorescein (resorcinophthalein).   The fluorescein is carried by the blood stream to the skin which, when viewed under ultraviolet, assumes a yellow color.   Maximum fluorescence is noted eleven minutes after the injection.

pedicle may be transplanted successfully though the various tests indicate circulatory efficiency at both ends of the pedicle but not in the middle; that twelve days after construction (also sixteen, twenty-one and twenty-four days after construction) these tests indicate vascular adequacy of the entire pedicle and

TABLE I

Observations on Development of Circulation in Tubed Pedicles in Experimental Animals*
Clinical observations, clinical tests and results following transplantation

AGE OF TUBED PEDICLE	GROWTH OF HAIR	DEGREE OF INDURATION OF TUBED PEDICLE	RATE OF RESORPTION OF SALINE WHEAL IN TUBED PEDICLES	FLUORESCEIN TEST	RESULT FOLLOWING TRANSPLANTATION OF TUBED PEDICLE
4	Poor	Marked	Prolonged over control area	Tubed pedicle showed homogeneous lack of fluorescence	Gangrene of tubed pedicle
7	Poor	Marked	" "	Fluorescence at both ends of tube less than the control area, no fluorescence in center of tube	Gangrene of transplanted end of tubed pedicle
9	Good at both ends of tube; poor in middle of tube	Both ends of tube soft; middle indurated	" "	Fluorescence at both ends of tube was equal to the control area, fluorescence in center of tube was less than that of control area	Successful transplantation of tubed pedicle
12	Good growth of hair throughout out length of tube	No induration	Equal to control area	Fluorescence of entire tube was equal to that of the control	" "
16	" "	" "	More rapid than control	Fluorescence of entire tube was greater than control	" "
21	" "	" "	" "	" "	" "
24	" "	" "	" "	" "	" "

* Rabbits were used in these experiments.

successful transplantation may be accomplished. Photographs of tubed pedicles and control areas as visualized during the fluorescein tests are shown in Figure 1

ARTERIOGRAPHY OF TUBED PEDICLES

In a second set of experiments the circulation in tubed pedicles in rabbits (constructed according to the plan outlined above) was studied by x-ray visualization of the vascular bed of the pedicle after intracardiac injection of sterile,
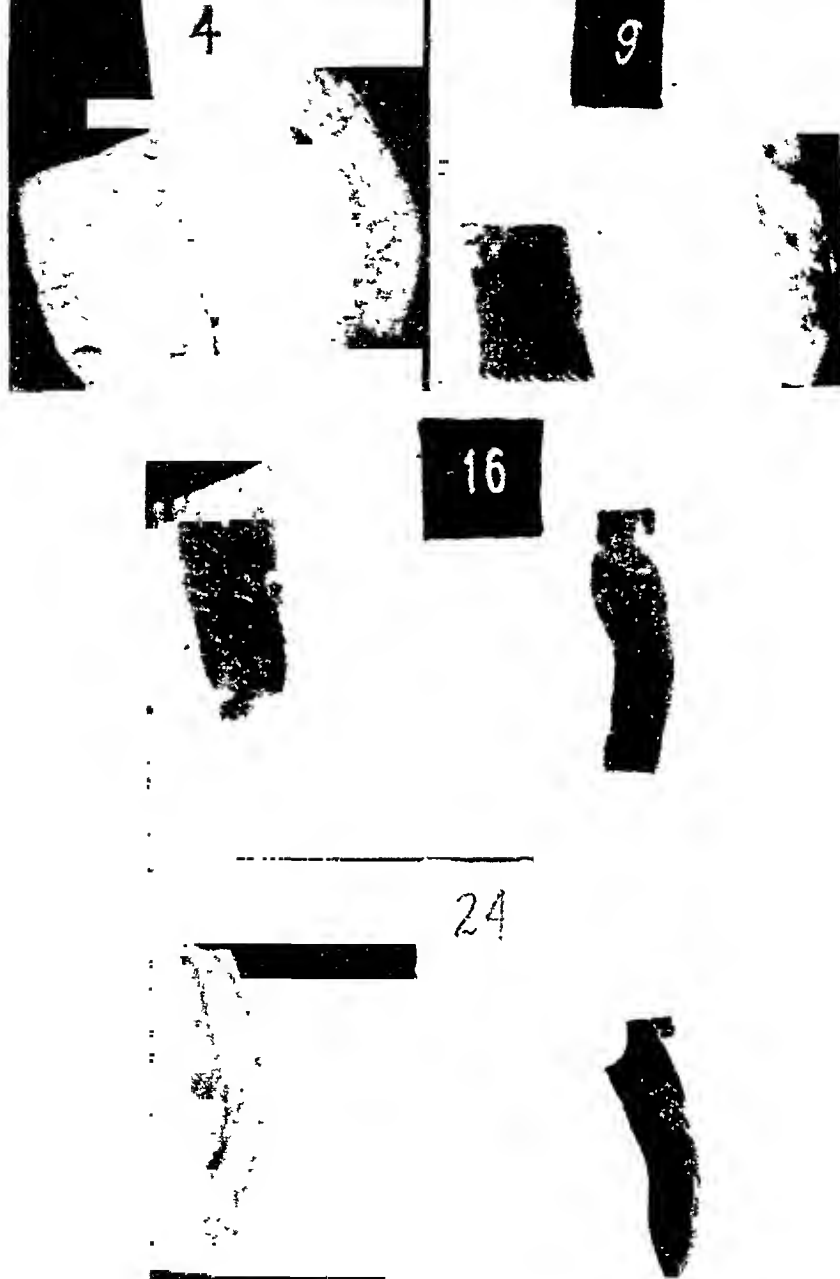
Fig. 1. Photographs of Tubed Pedicle and of Control Areas to Show the Degree of Vascularity as Evidenced by the Brightness of the Fluorescence

As labeled above, the tubed pedicles were photographed 4 days, 9 days, 16 days and 24 days after construction. Tubed pedicles are on the right of the photographs; the control areas are on the left. Note that the 4 day tubed pedicle shows less fluorescence than the control area. The 9 day tubed pedicle shows fluorescence equivalent to the control area at either extremity of the pedicle but not in the middle. Both 16 and 24 day tubed pedicles show fluorescence which is more intense than that of the control areas.
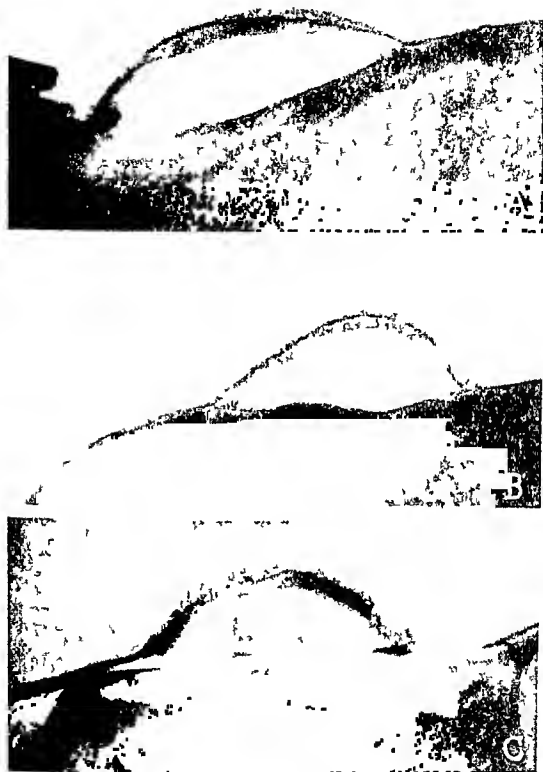
FIG 2 PHOTOGRAPHS OF X RAYS OF TUBED PEDICLES (CONSTRUCTED UPON RABBITS)
AFTER INTRACARDIAC INJECTION OF THORIUM DIOXIDE (THOROTRAST)

a This 10 day old tubed pedicle shows a long central vessel with fine vascular ramifications near the central part

b This 19 day old tubed pedicle shows a tortuous central vessel with fine vascular ramifications Many of these are show in on end views The tortuosity means that this vascular channel possesses greater length than that of the 10 day old tubed pedicle

c This 34 day old tubed pedicle shows a central vessel with two main branches and many fine ramifications It is noteworthy that the diameter of the central vessel does not appear to have increased over that of the 10 day tubed pedicle although the tortuosity indicates an increase in its length

colloidal thorium dioxide (26 per cent solution). In these studies tubed pedicles were visualized by x-ray 10 days, 19 days and 34 days respectively after construction. The thorium dioxide proved toxic to these animals and all were sacrificed. Photographs of x-rays of these tubed pedicles are shown in Figure 2. The 10 day pedicle shows a straight central vessel which is largest in diameter at its cephalic end. Fine vascular branches can be seen in the center of the pedicle and to a lesser degree at its caudal end. The 19 day pedicle shows a central vessel which is quite tortuous again with many finer ramifications. The end-on views of this vessel suggest that although the vessel possesses no greater diameter than the tube of only 10 days, it has grown in length. The 34 day pedicle shows a central vessel which divides into two branches with many fine ramifications. It is noteworthy that the calibre of the central vessels does not appear greater in the 34 day tubed pedicle than in that of 10 days duration though there appears to be a definite increase in the length of these vessels.

HISTOLOGIC STUDY OF TUBED PEDICLES

In a third set of experiments the same type of tubed pedicle was studied by histologic section. Here again tubed pedicles were studied 10, 19 and 34 days after construction. Photomicrographs are shown in Figure 3. In the tubed pedicle of 10 days duration eight main cutaneous arterioles are seen along with their accompanying veins. A few ingrowing vessels are visible. In the 19 day tubed pedicle ten main arterioles are present. Only two cutaneous veins are seen. A number of ingrowing vessels are visible but the vascularization does not appear to be increased over that of the 10 day tubed pedicle. The 34 day old tubed pedicle shows marked increase in the number of large arterioles with their accompanying veins. The degree of increased vascularization over the ten day old and 19 day old pedicles is very striking.

SKIN TEMPERATURE-TOURNIQUET TEST

Since the problem of the development of circulation in tubed pedicles is essentially the same as that of the development of collateral circulation in cases of peripheral vascular disease, Douglas suggested the application to tubed pedicles of one of the methods used in measuring the degree of vascular impairment in such cases. He determined the competency of the collateral circulation by recording the rate of return of the temperature of the subcutaneous tissues after release of a tourniquet previously applied to the two ends of a tubed pedicle. This test, a new application of that used by Brooks in peripheral vascular disease, has been referred to as the "temperature return test". Its execution called for the use of a sensitive needle-style thermocouple. In the experiments recorded herein, use was made of a more simple test for the determination of the adequacy of the circulation in tubed pedicles. This test consists of: (a) recording the temperature of the skin at that end of the tubed pedicle which is to be divided and transplanted; (b) the application of a tourniquet to the same end of the tubed pedicle (Figure 4); and (c) observation for a ten minute period of the temperature

FIG. 3. PHOTOMICROGRAPHS OF CROSS SECTION OF TUBED PEDICLES CONSTRUCTED
IN RABBITS

Mallory Azan stain was used to bring out the detail of the vessels.

a. Cross section of a tubed pedicle of 10 days duration Eight cutaneous arterioles
with their accompanying veins can be seen in this section

b Cross section of a tubed pedicle of 19 days duration Ten arterioles and two cu-
taneous veins are seen. A moderate number of ingrowing vessels are present There is
no histologic evidence that the vascularity of this pedicle is any greater than that of the
10 ...

... cle shows an abundance of large arterioles
...reased vascularity over that of the 10 day

of the skin[4] at the same point on the pedicle while the tourniquet is in place. A sharp drop in skin temperature is interpreted as evidence of insufficiency of the

FIG. 4. SKETCH SHOWING THE TECHNIQUE OF THE SKIN TEMPERATURE-TOURNIQUET TEST AS CARRIED OUT ON DOGS

The letters A, B, C and S refer to points at which skin temperatures were taken after application of the tourniquet.

circulation in the pedicle. Slight drop in temperature of the skin (one to two degrees centigrade) or no drop at all has been found to be evidence that the cir-

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[4] Skin temperatures were recorded by the Tycos Dermatherm. Because this test is concerned only with *changes* in surface temperature, a constant temperature room is not necessary.

culation through the unconstricted end of the tubed pedicle is sufficient for the nourishment of the entire pedicle.   Tubed pedicles three times as long as wide were constructed over the thoraco-lumbar region of dogs.   Skin temperature-tourniquet tests were recorded daily.   Application of a tourniquet at one end of these tubed pedicles caused a drop of 5 to 6 degrees centigrade in the temperature of the skin on the second day after construction of the pedicles.   On the seventh day after construction, and thereafter up to the fourteenth day, there was a constant response evidenced by a drop of about one degree centigrade.   The exact steps of the experimental procedure and the observations on the skin temperature tourniquet tests on one of the nine animals are listed herewith.

Dog #1939.   A tubed pedicle 15 x 5 cm. in size was constructed over the thoraco-lumbar region of a dog.   A padded plaster collar was applied to the neck of the dog to prevent his damaging the site of operation.   At 24 hour intervals the skin temperature-tourniquet test was carried out.   Data are listed below.   The letters A, B, C and S refer to positions shown in Figure 4.

Skin Temperature-Tourniquet Test (Dog 1939)—Seven Days After Construction of Tubed Pedicles

LAPSE OF TIME	TEMPERATURE OF SKIN AT POINTS A, B, C, S*				ROOM TEMPERATURE
	A	B	C	S	
min.	*°C.*	*°C.*	*°C.*	*°C.*	*°C*
1	30.1	30.2	30.7	30.7	29 3
2	30.2	30.3	30.7	30.8	
3	31.3	31.9	31 3	31.8	
4	31.7	31.3	31.7	31.5	29 4
5	32.3	32.3	32.3	31.8	
6	31.9	32.3	32.5	32.5	
7	31.9	32.3	32.5	32 5	
8	31.9	32 1	32.1	32.5	29.6
Tourniquet applied at C					
9	31.9	32 3	32.4	32.5	
11	32.8	32.3	32.3	32.8	
14	32.4	32.0	30.7	32.5	29.6
16	32.4	31 8	30.5	32.5	29.9
19	32.5	31.9	30.0	32.8	29 6
Tourniquet released at C					
21	32.5	31.7	31.9	32.8	29.6
24	32.4	32.1	32 3	32 8	29 3

* The location of points A, B, C and S is shown in Figure 4.

Observations in this series of experiments on nine different animals showed that, although the readings of the skin temperature-tourniquet test were fairly constant, the test did not prove to be a reliable guide to the efficiency of the circulation.   Occasionally tubed pedicles showed a drop of only one degree in temperature after application of the tourniquet, yet did not survive transplantation.   This led to the conclusion that this type of skin temperature tourniquet test is not a reliable guide to the efficiency of circulation in tubed pedicles in

dogs. The test may prove to have greater reliability in the human. Observations in the human are in progress at present.

CLINICAL USE OF FLUORESCEIN TEST IN TUBED PEDICLES IN MAN

In the course of correction of a severe post-traumatic scar of the foot in a 12 year old boy (New York Hospital Case No. 252032), fluorescein tests were made on a tubed pedicle every seventy-two hours for a period of thirty-nine days. The tubed pedicle which had been prepared in the thoraco-abdominal region comprised tissue measuring 20 x 8 cm. Fluorescein was injected into the ante-cubital vein and with the patient in a dark room and under ultraviolet light, the tubed pedicle showed homogeneous fluorescence equal to that of the adjacent tissues. The patient was taken to the operating room and the distal end of the pedicle was divided and transplanted to the wrist, using a trap-door type of incision and suture. Observations on the development of circulation through the newly transplanted end of the pedicle were started on the second post-operative day, and the test was repeated fourteen times in the following thirty-nine days. It should be mentioned in passing that fluorescein is said to be a non-toxic drug. It produces temporary yellow coloration of the skin and sclerae. The dye is excreted through the kidneys. During the period of these tests this 12 year old patient showed no toxic symptoms and no significant change in blood count. R.B.C. varied from 5,100,000 to 4,800,000, hemoglobin from 13.5 to 14.3 gm. and W.B.C. from 6000 to 8000. Observations on fluorescence showed that with the tourniquet applied to the thoracic side of the pedicle there was very little fluorescence of the tubed pedicle on the third day after its transfer. Dates of the tests and observations on fluorescence in the tubed pedicle are as follows:

DAYS AFTER TRANSFER OF TUBED PEDICLE	DEGREE OF FLUORESCENCE
2	Very faint; much less than adjacent normal skin
4	Very faint; much less than adjacent normal skin
6	Very faint; much less than adjacent normal skin
8	¼ inch of bright fluorescence of tubed pedicle near suture line
11	¼ inch of bright fluorescence of tubed pedicle near suture line
14	¼ inch of bright fluorescence of tubed pedicle near suture line
16	General intensity of fluorescence of entire pedicle is improved but still less than adjacent normal skin
18	General intensity of fluorescence of entire pedicle is improved but still less than adjacent normal skin
21	General intensity of fluorescence of entire pedicle is improved but still less than adjacent normal skin
24	General intensity of fluorescence of entire pedicle is improved but still less than adjacent normal skin
29	Entire tube showed fluorescence almost as bright as that of adjacent normal skin
32	Fluorescence equal to that of adjacent normal skin
35	Fluorescence equal to that of adjacent normal skin
39	Fluorescence equal to that of adjacent normal skin

The important observation is that fluorescence of the entire tubed pedicle did not approximate that of the adjacent normal skin until thirty-two days after the transfer of the pedicle to the wrist. It is apparent that if the tubed pedicle must get its circulation through a healed line of suture that thirty-two to thirty-five days are required before fluorescence is complete.

CLINICAL USE OF SALINE WHEAL TEST IN TUBED PEDICLES IN MAN

Tubed pedicles constructed in humans have been subjected to the saline wheal test prior to transplantation upon ten occasions   The tubes have been formed from twenty one to forty six days prior to transplantation   In nine of the ten tests the saline wheal upon the end to be transplanted resorbed more rapidly than that in the control area   All of these tubed pedicles were transplanted successfully   The one case in which the control wheal resorbed more rapidly than that upon the tubed pedicle was the one in which the pedicle had been formed forty six days prior to transplantation   Experience with this test has indicated that it evaluates accurately the circulatory efficiency of a tubed pedicle   Further experience with this test is needed in order to establish laws for its interpretation

SUMMARY

Observations are recorded in the study of the development of circulation in tubed pedicles in experimental animals   Several of the tests popularly used in the evaluation of circulation in cases of peripheral vascular disease have been applied in these animals   These tests include the saline wheal test, the fluorescein test and a modification of the temperature return test   This modification is referred to as the skin temperature tourniquet test   The clinical value of these tests was checked by arteriograms of the tubed pedicles (using thorotrast), by histologic section of the pedicles and finally, by the surgical transplantation of the pedicles at varying time intervals after their construction   The evidence indicates that when the degree of fluorescence of a tubed pedicle matches that of the adjacent normal tissue and when a saline dermal wheal resorbs as rapidly from the tubed pedicle as from the adjacent normal skin, the pedicle may be transplanted successfully   In addition, observations on the saline wheal test and on the fluorescein test in tubed pedicles in humans are reported   This study leads to the conclusion that both the saline wheal test and the fluorescein test give more accurate evaluation of the circulatory efficiency of a tubed pedicle than do clinical observations alone

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A METHOD FOR REPAIR OF THE UNILATERAL CLEFT LIP

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The method of repair of the single cleft lip has improved tremendously from a technical standpoint during the past several years.

The procedures in general use today are modifications of methods used for many years such as described by Mirault (1, 4), Rose (2), and Thompson (3). The Mirault operation as modified and improved by Blair and Brown (5) has had wide acceptance.

The following criteria must be met to have a satisfactory surgical repair of a single cleft lip:

1. Accurate skin, muscle and mucous membrane union.
2. Symmetrical nostril floors and vertical nostrils.
3. Symmetrical vermilion border.
4. Slight eversion of the lip.
5. A minimal scar which, by its contraction, will not interfere with the accomplishment of the above stated requirements.

We have in the past tried all of the commonly accepted methods for repair of the single cleft in an attempt to meet the requirements for a good result. The results were not consistently good, due principally to factors beyond the surgeon's control, namely—scar contraction which would distort the vermilion line and failure to maintain eversion of the lip even though it had been attained on the operating table. Many of our excellent lip repairs, therefore, required minor secondary corrections.

Three years ago many of us were privileged to attend a dry clinic presented by Dr. A. B. LeMesurier of Toronto. He showed a large group of postoperative single cleft cases in whom the results met all the requirements for an ideal lip repair. The uniformity of his results in all age groups from infancy to adult life inspired the author to attempt to duplicate his results. This report represents an experience with seventy cases. The first cases were done according to a pencil sketch made from a diagram Dr. LeMesurier presented to demonstrate his technique (9).

The principles employed by LeMesurier were apparently first described by Hagedorn (6, 7) in 1884 and modified by him in 1892. Hagedorn's method was devised to accomplish what his colleague, König, had attempted to do in order to obtain a zig-zag closure to prevent scar contraction. Hagedorn's method has obviously had little modern day application. References to his work are difficult to find and infrequently discussed.

We have attempted to simplify and somewhat standardize this method in order to make it applicable to all single cleft lip repairs. The method appears geometrically difficult but, actually, it is less complicated than attempting to
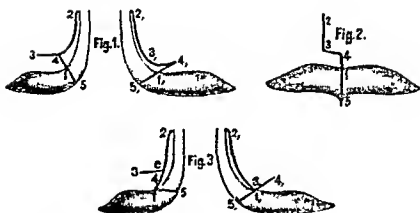
FIG. 1. HAGEDORN'S OPERATION

(From Hagedorn: Über eine Modifikation der Hasenschartenoperation Centralbl. für Chir., 11: 756–758, 1884.)
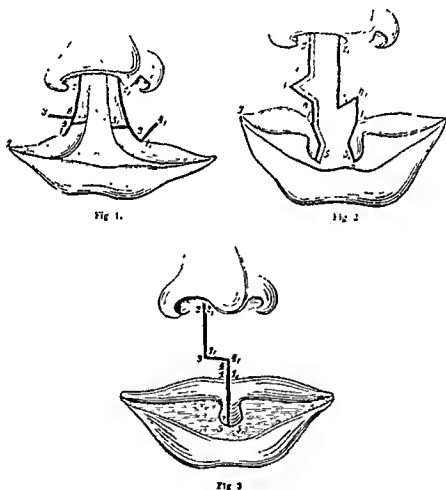
FIG. 2. HAGEDORN'S MODIFIED OPERATION

(From Hagedorn: Die Operation der Hasenscharte mit Zickzacknacht. Centralbl für Chir., 19: 281–285, 1892.)

use small triangles in the vermilion and elsewhere on the lip to accomplish with uncertainty what this procedure accomplishes consistently.

LIP TECHNIQUE

1. The lines of incision are marked with dye and key points are pricked with a needle dipped in the dye.

2. X is an imaginary point in the floor of the nose at the mucocutaneous junction.

3. The line A^1B^1 is estimated at approximately one-third to one-half of the normal length of the lip.
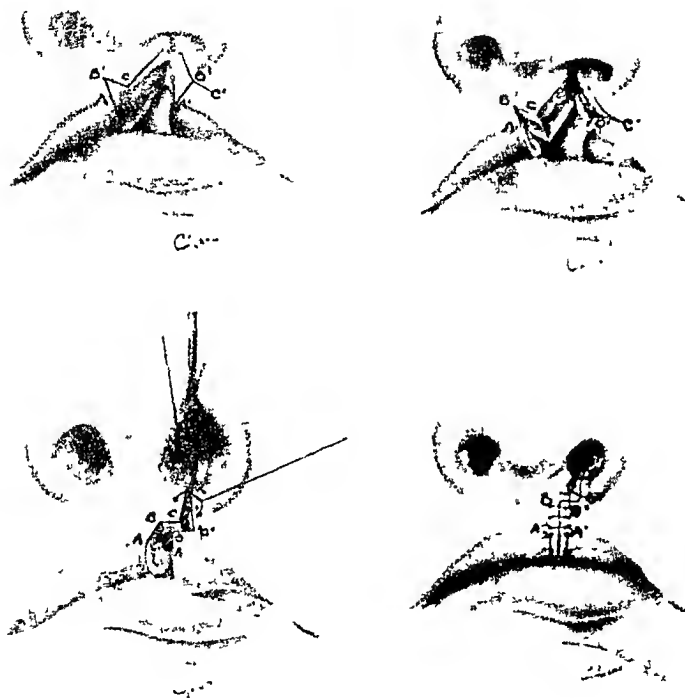
FIG 3 OPERATION AS PRACTISED BY AUTHOR

4. The line XB^1C^1 is marked. B^1C^1 is made equal to A^1B^1. It is noted that the line A^1B^1 passes at a point where the vermilion border is of normal thickness.

5. The triangle ABC is drawn with AB equal to A^1B^1 and BC equal to B^1C^1. The size of the triangle depends upon the degree of angulation of the medial side of the cleft from a vertical line. The greater the degree of angulation of the medial side of the cleft the smaller the triangle. It is usually made somewhat smaller than will be needed and enlarged as the situation demands. The line CX is drawn to permit excision of all mucous membrane on the medial side of the cleft.

6 The lip is separated from its attachments to the maxilla as needed for adequate relaxation

7 Incisions are then made. The author usually incises the line B¹C¹ a few millimeters short of the point C¹. This incision can then be extended as necessary

8 The line AB is incised. When a small hook is placed at C with lateral traction, the line BC can be judged for correctness of angulation and the angle ABC can be increased or decreased to make it closely approximate a right angle to accommodate the rectangular flap A¹B¹C¹

9 Skin and mucous membrane edges are undermined slightly for accurate suturing

FIG 4 OPERATION FOR CORRECTION OF NOSTRIL ASYMMETRY

10 Flap A¹B¹C¹ is sutured into triangle ABC with one 0000 plain catgut suture to approximate the muscle layer. One or two similar sutures approximate the muscle layer above this flap

11 AA¹ are then approximated accurately with a fine suture. The remainder of the closure of skin and mucous membrane is made with fine suture material of the surgeon's choice

THE NOSE

We have for years practiced the theory that the management of the single cleft lip is inadequate without a simultaneous correction of the associated nasal deformity. We formerly employed the technique of freeing the skin from the lower lateral cartilage through an internal alar incision to permit the cartilage to shift into more normal position and allow the skin to adjust itself over the repositioned cartilage. Packing was used to aid in holding the shape of the cartilage in the readjusted position. It became evident, however, after adopting

a different method of lip repair, that our nasal corrections should also be made more uniformly satisfactory. A few changes in technique of this procedure suggested by my preceptor (8) according to his method of doing a rhinoplasty have resulted in nostrils which are more consistently normal.

FIG. 5. PREOPERATIVE AND POSTOPERATIVE PHOTOGRAPHS OF INCOMPLETE CLEFT LIP TREATED BY THIS METHOD

FIG. 6. CORRECTION OF INCOMPLETE CLEFT LIP

NOSE TECHNIQUE

The following are the steps we now use for correction of nostril asymmetry associated with a single cleft lip deformity:

1. Make an internal alar incision 2–3 mm. inside the nostril margin, extending the incision down the full length of the columella at the mucocutaneous junction.
2. Separate the covering skin from the cartilages of the nose, using a small needle holder or a mosquito hemostat.
3. Make a scissors cut through the cartilage and lining at the point where the lateral crus of the tip cartilage should normally bend to join the medial

crus   Place one blade of a small scissors between the cartilage and skin as far as the distal end of the nasal bone   Hold the scissors so that the other blade closely hugs the septum   Cut the cartilage and lining with the scissors in this position

Fig 7   Correction of Incomplete Cleft Lip

Fig 8   Correction of Complete Cleft Lip

4   The affected nostril can now be adjusted to closely match the opposite side   The necessary width can be excised to make both nostrils match if there is an excessive amount of cartilage and attached lining extending below the incision
5   Approximate the wound edges with one or two sutures
6   Fold a piece of ½′ iodoform gauze to loosely conform to the shape of the opposite nostril and insert into the nostril, moulding the cartilage into apposition with the skin
7   Apply a collodion gauze strip over the tip of the nose and another below

the tip attached to each ala and the columella to hold the gauze roll in position.

The skin sutures are removed from the lip on the third postoperative day and are replaced by a collodion-gauze dressing. This dressing is changed as needed for ten days. The gauze roll is removed from the nostril in four to six days. The collodion-gauze nasal dressing is maintained during the entire dressing period. Vermilion and buccal mucous membrane sutures and those in the floor of the nose are removed in eight to ten days.

FIG. 9. CORRECTION OF COMPLETE CLEFT LIP

DISCUSSION

The objections to the use of this type of lip repair are few and are far outweighed by the advantages. The triangle made on the medial side of the cleft cuts into the philtrum. This does not appear to influence the quality of the result. The amount of tissue which is discarded appears great at first glance, but careful analysis of this tissue reveals that it is not satisfactory for utilization in the repair, nor is it necessary to effect the repair. Satisfactory eversion of the lip is a consistent end result. The right angled offset line of closure is one which offers far less opportunity for scar contraction which so frequently distorts an excellent repair done by other methods. Wherever a result has been unsatisfactory in this series the cause can be attributed to the surgeon's failure to make accurate adjustments at the time of closure and not to scar contraction during the healing process.

The Hagedorn-LeMesurier method has been very useful to us in the correction of secondary cleft lip deformities. It is particularly useful in these cases because eversion of the lip is so often the objective. The other features which make it a useful procedure for primary repair are also applicable to its use in secondary corrections.

CONCLUSIONS

1. A revival of an old method for single cleft lip repairs as originally done by Hagedorn has been presented. This work was inspired by an observation of the excellent results obtained by LeMesurier.

FIG 10 CORRECTION OF SECONDARY CLEFT LIP DEFORMITY

FIG 11 CORRECTION OF SECONDARY CLEFT LIP DEFORMITY

2 The method of Hagedorn has been slightly modified, aiming toward simplification and standardization for wider application

3. Cutting the philtrum does not appear to interfere with the excellence of the results.

4. Good lip eversion is invariably obtained.

5. Poor results due to linear scar contraction are largely eliminated. In this series the poor results have been due to the surgeon's inaccuracy in the finer details of approximation.

6. If a linear scar on the lip is a stigma of the classical cleft lip operation, this factor is eliminated.

7. The nostril adjustments are made at the time of the lip repair. A slight modification has been made in the routine procedure for nostril adjustment with an improvement in end results.

8. The method is useful for secondary lip corrections.

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MANDIBULAR RECONSTRUCTION, WORLD WAR II

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The technique of mandibular reconstruction following nonunion of fractures or loss of bone originated during the first World War. Ivy, in 1920, reported a preliminary series of 103 cases performed by American workers using a variety of source materials. Although at that time only seven cases of iliac grafts had been submitted, this technique of repair of bony defects of the lower jaw nevertheless rapidly became popular and by World War II was in most instances preferred over other types of operation. During the period between the two wars experimental and clinical experience with cancellous bone gave abundant evidence of its superiority to cortical bone. The iliac crest in addition to providing a large amount of readily available cancellous bone was found to be particularly suitable for use in mandibular restoration because it may be readily shaped to conform to the normal contour of the jaw and may be cut to make a foundation of sufficient width for support of a dental prosthesis.

In an attempt to survey cases of bone grafts to the lower jaw performed on service personnel in World War II, statistics have been collected from as many Army and Navy Plastic Surgery Centers as possible. The following workers in this country have submitted data: Brown, Cannon, Davis, Peterson, Lischer, Moore (Valley Forge General Hospital); Greeley (Oak Knoll Naval Hospital); W. B. Macomber (Dibble General Hospital); Tanzer (Bushnell General Hospital, Cushing General Hospital); Webster (Naval Medical Center at Bethesda, Maryland); D. W. Macamber, Karleen (O'Reilly General Hospital); Martin (Northington General Hospital, Percy Jones General Hospital); Saderberg (Crile General Hospital, Percy Janes General Hospital, Valley Farge General Hospital); Kirkham, Mills, and Tennison (San Diega Naval Hospital); Schuessler (Beaumont General Hospital); Straatsma (Brooklyn Naval Hospital); Steffensen (Newton D. Baker General Hospital); Blocker, Cranin, Stout, Weiss (Wakeman General Hospital). These men have reported a total of 1,010 mandibular bone grafts performed in the last six years. The majority of cases were handled between 1944 and 1946 during the peak of activity of the various plastic centers.

Statistics which appear in the table below are in many cases estimates rather than accurate reports because of lack of access to records. It was particularly difficult to obtain figures on complications, and lack of follow-up may be responsible for a higher percentage of primary take than should actually be the case.

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Sources of Graft, World War I (U. S Casualties) (Ivy)

Pedicled graft from mandible	31
Ramus sliding	3
Osteoperiosteal from tibia	38
Crest of ilium	7
Cortex of tibia	17
Rib	6
Oo-bone	1
Total	103

Operative Results, World War I (U. S. Casualties) (Ivy)

Number of cases of primary union	78
Number of partially successful	8
Number of failures	14
Number of doubtful results	3
Total	103
Percentage of primary take	76

Sources of Grafts, World War II

Ilium	836
One-piece with or without chips	823
Chips alone	13
Rib	151
Tibia	23
Total number of mandibular grafts	1,010

Operative Results, World War II

Number of cases of primary union	917
Number of failures, partial or complete	93
Number of failures regrafted successfully	68
Percentage of primary take	90.7
Percentage of final take	97

Operative Complications, World War II

Complications	
Deaths	5
Pulmonary embolus	2
Anesthetic death	2
Alcoholism	1
Drainage	90
Hematomas	4
Opening into oral cavity	27

Complications of Donor Site, World War II

Superficial drainage	75
Hematoma	30
Suppuration	2

The largest series of cases were reported at O'Reilly, Valley Forge, Dibble, Beaumont, and Wakeman General Hospitals. As may be noted from the table,

rib grafts were used in 14.9% of cases. They were most popular at Valley Forge and Dibble General Hospitals. Two were performed at O'Reilly, four at Cushing, three at Beaumont, and three at Oak Knoll. Osteoperiosteal grafts from the tibia were employed in two per cent of the cases. These were reported from Dibble, O'Reilly and Cushing General Hospitals. All other centers employed the ilium as the sole source material for bone grafting to the lower jaw.

The time of operation based on last evidence of drainage averaged among the various surgeons from three to six months. Earlier grafts were performed as a general rule by Macomber and Karleen at O'Reilly, and also by Straatsma and George Webster. It was felt by most workers that better results were obtained in grafts for appreciable bone loss when operation could be delayed for at least six months.

Material used for internal fixation of grafts was in most instances stainless steel wire. There was occasional use of tantalum wire, and vitallium plates and screws were employed in a few cases in the San Diego Naval Hospital. Equally good results were obtained with all types of fine suture material: catgut, silk, cotton, nylon, and stainless steel wire. During the last year of the war many workers, the author included, began to feel a marked preference for wire, which, being absolutely inert, provokes no local foreign-body reaction in the tissues.

The majority of bone grafts were performed under general anesthesia with endotracheal gas, oxygen and ether. At seven centers a combination of spinal anesthesia, high mandibular block and local novocain infiltration was used with good results. In the opinion of the writer the latter method was far more satisfactory than trusting endotracheal anesthesia to an army technician. In addition it had the advantages of minimizing post-operative complications and of giving a clearer working field because of the hemostatic properties of the novocain-adrenalin solution.

Routine chemotherapy was employed in most hospitals, both pre- and post-operatively with tendency to use larger dosages of penicillin during the latter part of the war as this drug became more plentiful. Following results borne out by Pulaski's experimental work, we have also employed streptomycin in addition to sulfadiazine and penicillin in our post-war series of cases.

The average period of complete bedrest after operation was from five to ten days, depending upon discomfort at the donor site. In many instances patients were ambulatory before this period either with or without permission of the surgeon. Splints were left in place for a period of from six to eight weeks as a rule, with an additional two to four weeks if required for complete clinical union.

As mentioned previously, tables of statistics given in this paper are incomplete so far as follow-up examination is concerned. During the past eighteen months we have attempted to study late results in detail on a total of eighty patients on whom operation was performed at Wakeman during the war and at either Percy Jones or Valley Forge General Hospital on a civilian consultant basis since December, 1946. At the present time in this group a total of nine primary

failures, 11.2% must be reported. This corresponds to the 11.9% of primary failures reported by W. B. Macomber in a recent article and also to the 11.8% reported by the group at Valley Forge General Hospital where there was an opportunity to have patients return for repeated examination. Of the seven cases of ours in which tantalum trays were employed to give contour in angle-to-angle loss of bone, four have been removed because of drainage from the area or for non-union. In only one instance was it necessary to remove the bone graft. All nine cases have been successfully regrafted so far as may be judged by clinical evidence of union and reports from the patients themselves. The most important factors in partial or complete absorption of mandibular transplants appear to be a combination of infection and failure on the part of the surgeon to provide adequate soft-tissue covering in those patients with massive avulsion wounds. At least in our experience we feel that one-piece block grafts of pure cancellous bone from the ilium produce the most satisfactory results from the standpoint of both contour and function.

Fixation and immobilization of mandibular fragments varied considerably according to the size and character of the defect, position of teeth and state of occlusion. In edentulous jaws we employed before and after operation a modification of the Gunning splint. With one edentulous fragment and the other containing teeth, the latter should be kept in occlusion by a flange splint during the waiting period. At operation the edentulous fragment, liberated on all surfaces, was brought into proper position and maintained by a wire through the angle or ramus of the jaw which protruded through the skin and was attached to a bar coming around the face from the intra-oral splint. Where both fragments contained teeth, a cap-metal splint with rigid cross bar was employed pre-operatively, and at the time of insertion of the graft two interlocking cap-metal splints were employed. Toward the end of the war we found that we could utilize simpler devices for fixation to great advantage and often maintained occlusion with the use of multiple-loop wiring and elastic traction on tooth-containing fragments.

CONCLUSION

The second World War gave rise to a large volume of cases requiring mandibular bone grafts, and the advice of the surgeons who initiated the technique in World War I has proved of great service to workers in every plastic surgery center. There have been many patients with massive avulsion wounds of the lower face, and their survival may be attributed to the availability of well-trained technicians among service personnel and the use of plasma, blood transfusions and chemotherapeutic agents. Equally good results have been obtained in small defects using both rib and ilium as the source material for grafting. For the relief of extensive loss of bone we feel that large block grafts of pure cancellous bone from the ilium provide the most satisfactory material for operative repair. We cannot escape the fact, however, that there are no short cuts to achieving successful results in any bone grafting procedure.

CANCELLOUS ILIAC BONE IN DEPRESSIONS OF FOREHEAD, NOSE AND CHIN[1]

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Dependability of cancellous bone grafts as supporting tissue for contour defects of the face has won enthusiastic loyalty of many surgeons A number of us are indebted to our English colleagues who were perfecting this technic and teaching the method of its use during the recent war Time seems not to detract from early impressions of its great utilitarian value, but clearer definition of indications for its application and limitations is now possible In order to appraise it, we should compare it with other tissues used in comparable defects By common consent, the majority of workers have abandoned foreign substances—as ivory, acrylic, metal Autogenous and homogenous cartilage grafts are accepted, the choice depending upon convenience, time, facilities, experience and usually discussion with the patient In some instances both are used, as in Dr Lyndon Peer's mixture of preserved cadaver cartilage and fresh autogenous cartilage diced and used in the same defect My own preference is for autogenous tissue whenever circumstances permit and the added surgery is not dangerous to the patient I shall make no attempt to depreciate the usefulness of cartilage, especially in the nose and smaller depressions where rigid support is not essential However, I believe that bone provides a superior replacement for bone and the ultimate results in correction of depressions of forehead, malar compound, and chin more nearly simulate the original anatomical structure

Procurement of iliac bone is commonly thought of as a formidable operation Indeed, it is a fair sized responsibility when a large block of bone with or without cortex is required, as for a mandibular graft There have not been any important complications in my own experience or in that of others, to my knowledge When only a small or moderate amount of cancellous bone is required, its procurement may be a simple matter Local anesthesia is adequate, and considerable bone may be removed through a very small incision When the iliac crest is exposed and a plug of its cortex removed, sufficient bone may be scooped out with a small strong sharp curet If more is required, any desired length of the crest is unroofed with a sharp half inch chisel Blocks or chips of bone are then removed with flat slightly curved chisels or gouge In this manner, the outer table is not turned down and muscles of the thigh do not cause motion in healing parts during convalescence Postoperative discomfort is thus minimized Bleeding and hematoma are avoided by packing the marrow cavity with oxycel or gelfoam Drainage of the wound is not necessary

Survival of cancellous bone grafts does not depend upon actual contact with bleeding bone, but placement in a bed of good vascularity is mandatory Thus

FIG. 1. TRAUMATIC SADDLE NOSE REQUIRING SUPPORT OF DORSUM AND COLUMELLA
Graft entirely cancellous except one side of columellar strut

FIG 2. TRAUMATIC DEPRESSION OF GLABELLAR REGION CORRECTED BY MOLDED CHIPS
AND "CRUMBS" OF CANCELLOUS ILIAC BONE

the graft will be attached within a few days in a depression in the skull, upon orbital rim, nasal bones, or chin if applied firmly against freshened bone or periosteum. However, if the graft is merely laid into soft tissues it may gradually disappear. Rate of disappearance, of course, is variable but seems to be

FIG 3 TRAUMATIC DEPRESSION OF FRONTAL BONE

Small bone chips inserted through old scar If scar is not present incision is made behind hair line

FIG 4 VERY LARGE DEPRESSION OF FRONTAL REGION AND NOSE CORRECTED BY TWO LARGE AND MANY SMALL PIECES OF CANCELLOUS BONE

FIG 5 CONGENITAL MALDEVELOPMENT OF NOSE AND MAXILLAE

Mid columellar incision was adequate for insertion of bone into dorsum and columella of nose and upon periosteum of maxillae

FIG. 6 CHIN INADEQUATE, CONTRASTED WITH OTHER FAVORABLE FEATURES

Correction with one block, grooved to preserve a characteristic mid-line "dimple" in chin, and several small pieces of cancellous bone.

directly related to viability of adjacent tissues, to pressure, and to motion. For example, two female patients agreed to return for surrender of unused bone

hoarded in subcutaneous abdominal fat following correction of saddle nose Much to my displeasure, pieces of bone readily palpable a month after operation had disappeared six and ten months later In contradistinction postoperative observation in two male patients showed persistence of hoarded specimens One was removed and sectioned after two and one half months there had been no reduction in size and the pathologists described the bone as surrounded on all sides by capsule or cortex and sections showed new bone beneath the fibrous investment The other patient was seen after twenty months The block of bone was grossly the same size as when it was implanted X ray showed dense cortical investment, less dense central portion, and was described as resembling

FIG 7 CONGENITAL RETRUSION OF CHIN OCCLUSION SATISFACTORY
Corrected possibly over corrected by pieces of iliac bone varying in size and molded by digital pressure Incidental rhinoplasty enhanced final result

a metacarpal bone The patient was not available to surrender the specimen for microscopic study Absorption of the bone in the females and persistence in the males was probably due to difference of its environment—soft globular oily fat on the one hand, firm fibrous fat and fascia on the other Similarly, grafts upon an old abscess site or nasal septum may not become firmly fixed, diminish in size, but have not disappeared Those placed upon broad areas of ' roughed up" periosteum have been firm almost at once, retaining their original size and shape indefinitely In two cases of receding chin that were over corrected, secondary operation has been indicated to reduce the size of the graft after a year

Depressions from trauma often present a scar in overlying skin which can be re opened or excised to permit preparation of the recipient site and insertion of the bone In others, when the surgeon may prepare the bed blindly through a

more remote incision and is sure of hemostasis, bone chips or "crumbs" may be inserted with a small spoon or spoon-curet. Perhaps Dr. E. H. de Kleine's chondrojet would possess the same advantage which the author describes for its use in managing diced cartilage. In the earlier cases it was thought that a single block, usually surrounded by many small bits of bone to avoid dead space, comprised the proper architecture. More recently, however, only small bits have been used. An estimated bulk is carefully placed in the recipient site, the base of which has been scraped with a sharp curet and about which local tissues have been freed only enough to facilitate packing of the bone. Digital pressure will then shape the mass as one might manipulate so much clay. When it is determined that the bulk is correct, the wound is closed without drainage and final molding performed. The dressing consists of moist cotton, dental wax, or molded material of one's choice. Usually there is no need for pressure after seven to ten days.

Cortical bone is used only when rigidity is required as in a columellar strut or graft for ununited mandibular fracture; in those instances a minimum amount is left on one side in order to leave as much cancellous bone exposed as possible. Wire fixation is used only when required, as in fixing the cancellous side of a graft in contact with freshened ends of mandibular bone.

In such cases, later removal of the wire is elective.

Figures 1 to 7 illustrate several cases in which cancellous iliac bone was used.

CONCLUSIONS

1. Cancellous iliac bone has given superior results in correction of depressed skull and facial bones.

2. Procurement of the bone is possible with local anesthetic; small or moderate quantity is available through a hole or trap-door in the iliac crest. Minimum trauma is followed by little postoperative discomfort.

3. Cortical bone is used only where rigidity is at once required.

4. Wire fixation of the graft is not needed in the majority of cases.

5. The grafts became promptly fixed, are permanent, and retain their original dimensions when placed in vascular tissue, not necessarily in contact with denuded bone.

6. Cancellous bone disappears, is partially absorbed or replaced by fibrous tissue, when imbedded in fat or placed in a defect where circulation is poor. Motion will inhibit or impair its attachment and encourage its absorption.

7. In some cases of saddle nose where both dorsal and columellar supports are required, bone grafts may fulfill the requirements at least as well as autogenous and more dependably than preserved cartilage.

8. A minimum incision at the iliac crest is a lesser surgical undertaking for doctor and patient than one over the costal cartilage.

9. Cancellous bone grafts are more firm and anatomically correct than cartilage grafts for replacement of maldeveloped, depressed, or destroyed facial bone.

FUNDAMENTALS IN THE SURGICAL TREATMENT OF MANDIBULAR PROGNATHISM

CARL W. WALDRON, M.D., D.D.S., CONRAD I. KARLEEN, M.D., D.D.S., AND
CHARLES A. WALDRON, D.D.S.[1]

Surgical correction of mandibular prognathism has become a commonplace procedure, and numerous methods and techniques have been described and published in recent years. It is a fact that most patients with this deformity are interested primarily in improving their facial appearance rather than in having a poorly functioning or nonfunctioning dental occlusion changed to one that is wholly acceptable. This, however, does not relieve the surgeon of his responsibility to secure both cosmetic improvement and a maximum degree of restoration of dental function.

Well-considered preoperative examination, study, and diagnosis are essential to these ends for it is axiomatic that in each individual case a method or technique may be selected that is at least slightly preferable and frequently much superior to other methods that might be employed. In cases where either an osteotomy of the ramus or a resection of bone from the body will result in a satisfactory occlusal relationship, the individual preference of the surgeon for one technique may outweigh any slight advantage of the alternate technique.

It is our feeling that elective surgery of this type justifies but one type of surgical technique—the best that can be offered—an exact open view control of both proximal and distal fragments after division of the mandible. Blind division of the ramus or of the condyle neck (Kostecka's method) is based on the fact that most of the displaced fractures of the ramus and condyle of the mandible heal without functional disability. Blind division does not meet the fundamental requirements of exact surgery of bone for the upper fragment may be forced backward when the body is repositioned. Consequently after the removal of intermaxillary fixation, the upper fragment may be pulled forward by the external pterygoid muscle with resulting slight or greater recurrence of the prognathic deformity with or without opening of the bite. Furthermore, in blind division of the bone severe hemorrhage may occur necessitating exploration and ligation or deep ribbon gauze packing. Displacement and lack of effective contact of the fragments may occur at the time of surgery or subsequently due to the pull of the temporal or external pterygoid muscles.

The preoperative examination and records should include profile and full face photographs, a 6-foot direct profile and lateral jaw roentgenograms, and alginate impressions of the upper and lower teeth from which casts are made of dental stone. Duplicate sets of casts are desirable. A third plaster cast of the lower teeth which may be sectioned readily will prove useful in determining whether removal of sections from the body of the mandible will afford as satisfactory occlusion of the teeth as would a ramus osteotomy.

By means of a face bow the cast of the upper jaw is mounted in a special articulator in proper relation to the temporomandibular joint and the Frankfort horizontal plane. The cast of the lower teeth is placed in relation to the upper cast by a transfer wax bite from the patient. Vertical and diagonal marks are then made on the teeth of the upper and lower casts and rechecked with the patient's own teeth. The lower cast is then moved to the desired occlusion, and the indicated set-back measured and recorded for each side. Any indicated elevation or depression of the incisor or molar region is measured to determine the
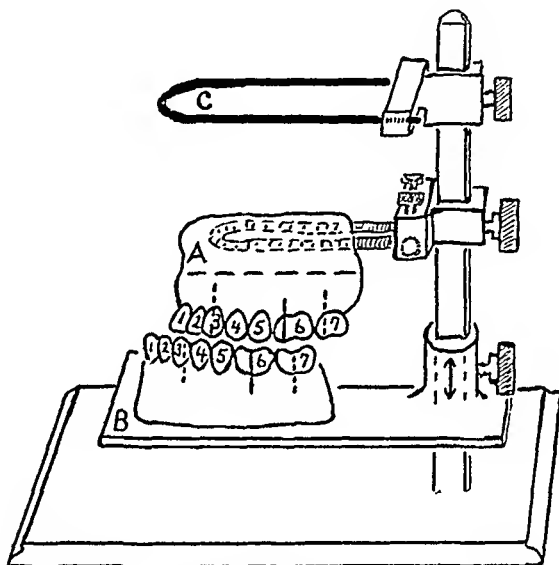

Fig. 1. ARTICULATOR USED FOR THE PREOPERATIVE STUDY AND SELECTION OF THE
OPERATIVE SITE

A. Cast of the upper teeth mounted in correct relation to the temporomandibular joint and Frankfort plane.

B. Horizontal platform for cast of lower teeth. Duplicate plaster casts of the lower teeth may be sectioned in the bicuspid molar region and a portion removed to establish the required setback and amount of bone to be excised at operation.

C. Forehead wire parallel to Frankfort plane used for rechecking accurate mounting of cast of upper teeth.

angle of division of the ramus. Sections are removed from the plaster cast of the lower teeth to establish the desired occlusion. By replacing the anterior segment in its prognathic position, the spaces between it and the posterior segment on either side are measured to determine the size and shape of sections of bone to be removed from the body of the mandible, should this method be chosen.

It is our concept that no one method of surgical approach is indicated for all cases of prognathism. A thorough study of the casts of the teeth may show that either osteotomy of the ramus or resection of bone from the body will give a good result, or that either method may be contraindicated under certain conditions. We feel a thorough study of the casts is the all-important preoperative consideration in determining the best method of surgical treatment. Most important is

the occlusal relationship in the molar region. In some patients the horizontal occlusal position of the lower teeth is as much as the mesio-distal diameter of one or two molar teeth (2 cm.) anterior to its normal occlusal relationship. In such cases the excision of a section of bone from the tooth-bearing area of the mandible with setting back of the anterior segment to further shorten the occlusal surfaces is definitely contraindicated except in cases of marked under development of the maxilla. Excision of a section distal to the molar teeth does not
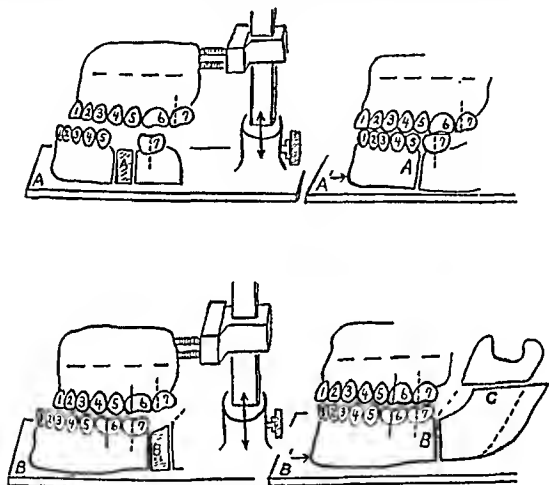
Fig. 2. Mandibular Prognathism—Group I. Casts of the Teeth Occlude in a Reasonably Normal Manner with Little or No Lack of Occlusal Arch Development

shorten the dental arch and would be satisfactory as would a ramus osteotomy. The choice might depend upon the position of the angle and the desirability of moving it backward to improve a long, obtuse, forward positioned angle.

In a large percentage of the prognathic patients with a full complement of teeth, the fitting together of duplicate casts will reveal a remarkably good occlusion which leads one to believe that the pattern of growth of the mandible and maxilla has been disturbed but slightly by the factors producing the prognathism. In such cases we feel the surgical division should be behind the second molar tooth, either a resection in the third molar-retromolar region or a ramus oste-

otomy.   It is notable that most young adults of today have a full complement of teeth in good condition which increases the responsibiliby of the surgeon to secure the best possible occlusion.

Study of the casts may demonstrate that a moderate amount of orthodontic treatment before surgery will improve the upper arch to make intermaxillary fixation more secure and improve the immediate postoperative occlusion.   In cases where malposition of one or more teeth will not interfere with effective immobilization, orthodontic treatment should be postponed until after surgery. The preliminary study of one of our patients, who had been accepted for admission to West Point, showed the necessity of considerable orthodontic adjustment in order for him to pass the dental requirements.   Orthodontic treatment was begun before surgery and was continued during the eight weeks of immobilization and after removal of the tie wires.   He entered West Point, graduated, and served in World War II.

The necessity of careful study of the maxilla cannot be over-emphasized.   The relative size of the upper jaw in comparison with the lower jaw, the number of teeth present and their condition, and potential future service or probable inevitable loss and replacement are factors influencing the selection of the site and technique of operation.   One should always keep in mind the best interest of the patient's future occlusion and efficient mastication.   Upper jaws with only a few remaining teeth may be found much smaller than normal with foreshortened alveolar process ridges and tuberosities.   Careful study of the occluded casts will determine where a ramus osteotomy would place the posterior lower molars distal to the tuberosities to interfere with an artificial denture.   In such cases resection from the body is indicated where teeth are absent in the bicuspid first molar region.   When the mandibular molars are present and in good condition, it is more desirable to extract the third molars and remove a section from the molar-retromolar region.   A long, forward, obtuse angle of the mandible may indicate that a ramus osteotomy together with the extraction of the third molars will be better rom a cosmetic standpoint.

In quite a number of cases where the posterior molar is in a forward position the retromolar region and the anterior aspect of the ramus are so close to the tuberosity region of the maxilla that the successful wearing of dentures would be greatly handicapped by the lack of a normal denture clearance space.   In these cases neither a resection of bone anterior to the molar region nor in the retromolar region would give the best possible over-all result, and consequently a ramus osteotomy would be indicated.

Should the upper jaw be in a retruded position, one must consider whether the mandible should be set back the entire distance or to a compromise position to avoid retrusion of the chin.   If a reasonably full complement of upper teeth are present, the lower jaw should be set back to the best possible occlusion even if subsequent bone or cartilage graft is necessary to give normal prominence to the chin. If the retruded maxilla has only a few useful teeth, consideration must be given to the optimum position of the mandible in relation to a partial or full denture. Consultation with a prosthodontist before surgery should be arranged.

Fig. 3. Group II. ....   ' THE UPPER JAW COMBINED
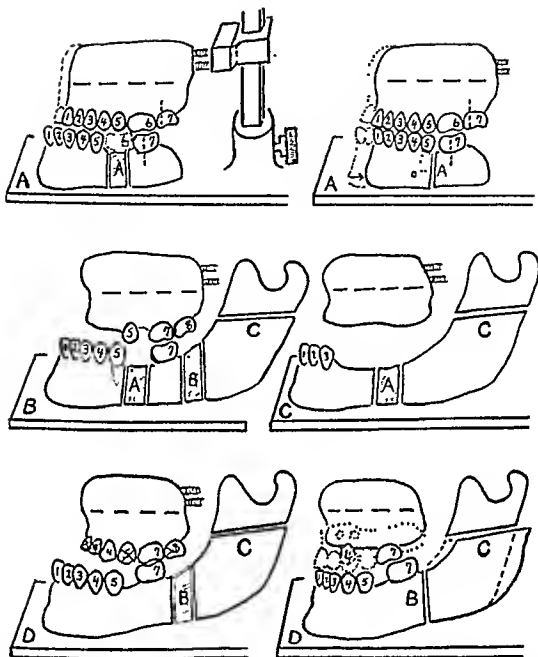   WITH M   ·   AND RELATIVE
The degree of d(sefulness of the remaining
teeth, dental restorative problems and posterior occlusal relationships are factors that
should ing ...   .   of the site of operation.

...., denture clearance space t
angle, and the in land at craf range of the surgeon

proposed over-denture.

The adult bilateral cleft lip and palate patient may present a markedly deformed, retruded, and immature maxilla and prognathism.   The forward position of the mandible frequently is found to be both relative and actual when the chin-forehead profile is evaluated.   Much can be accomplished for these patients by setting the mandible part way back.   This makes possible the construction of a dental restoration (usually an over-denture) which will function fairly well, will support the lip and look well.   Without a set-back of the lower jaw, the excessive extra-alveolar leverage of an over-denture set far forward would most surely be doomed to failure.   Either a resection of the body or a ramus osteotomy is successful in these cases.   We have performed ramus osteotomy for eight such patients with excellent results.

Faced with the necessity of having all teeth removed and wearing artificial dentures, many older prognathic patients will be doomed to years of unsatisfactory dentures unless the lower jaw is repositioned.   The need for this should be recognized before the remaining teeth are extracted for they are most important for splinting and intermaxillary fixation after surgery no matter whether body resection or ramus osteotomy is undertaken.   A common dental condition is that of an edentulous upper jaw with six or seven remaining lower anterior teeth.   Prognathic patients may be seen with this dental situation who have been handicapped for many years by unsatisfactory dentures.   In all edentulous patients or those to become edentulous, the relative length of the alveolar process ridges of the upper and lower jaws should be considered in the choice of the site of operation.   In mandibles with no excessive comparative length of process, particularly in those with an obtuse angle, osteotomy of the ramus is preferable for when new dentures are constructed there is a tendency to produce a prominence or jowl after body resection is performed.   A space of at least 5 mm. for denture clearance between the tuberosities and the mandibular molars or alveolar process is necessary to obtain proper function of an upper denture.   This may be evaluated on matching the casts and determining the best site of surgery.   Additional methods of intermaxillary control and fixation are necessary in edentulous patients.   These include an upper denture splint with buccal tubes in the cuspid-molar region to which are attached extra-oral arms to connect with a light headcap.   Hooks may be attached to the upper denture splint to which the lower teeth (if present) may be secured by wires or rubber bands.   In the completely edentulous, an occluding lower splint may be constructed and maintained by circumferential wiring.   Further support may be secured by vertex chin bandaging. In the exceptional case a Kirschner wire or Steinman pin may be drilled through the symphysis and the projecting ends secured to the headcap.

Open bite malocclusion with a slight or a considerable degree of prognathism presents the greatest problem.

Two types are apparent, each presenting varying degrees of prognathism. Matching of the upper and lower casts may reveal that the occlusal planes of the lower teeth (with or without minimal grinding of the cusps of certain teeth) are capable of being repositioned into an acceptable occlusion with the upper teeth. The second type presents an occlusal convexity with depression of the incisor re-

gion which prevents occlusal contact of the casts in either the molar or incisor region because of the convexity of the cuspid-bicuspid region. In the second type if the molar teeth relationship is less than 1 cm. forward and an extraction space exists, a well-planned division of the body with resection of a predetermined section of bone (V-shaped, Keystone, or Y-excision) will be more satisfactory, particularly
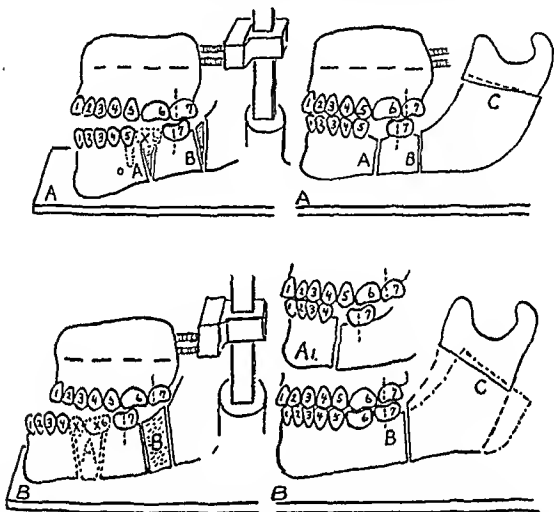

FIG. 4. OPEN-BITE MALOCCLUSION AND PROGNATHISM. CASTS OCCLUDE IN A REASONABLY NORMAL MANNER. GROUP III, A

A. Open bite with slight or no prognathism, may be corrected by a V-shaped excision in omolar

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when the angle of the mandible is not forward and obtuse. The site of operation, in the bicuspid-molar region or behind the second molar, will be governed by the same considerations that have been discussed depending largely on the degree of prognathism and the best possible occlusion that may be secured.

If the open bite deformity is accompanied by minimal or no prognathism, operation anterior to the last molar teeth is the method of choice, and osteotomy of the ramus is usually contraindicated. The plaster cast of the lower teeth should be built down to approximate the height of the body of the mandible. It should

then be divided and the cut surfaces trimmed until the best possible occlusion is obtained. By replacing the anterior segment of the cast in its open bite position, the space on either side is measured and templets of lead made to be used at opera-
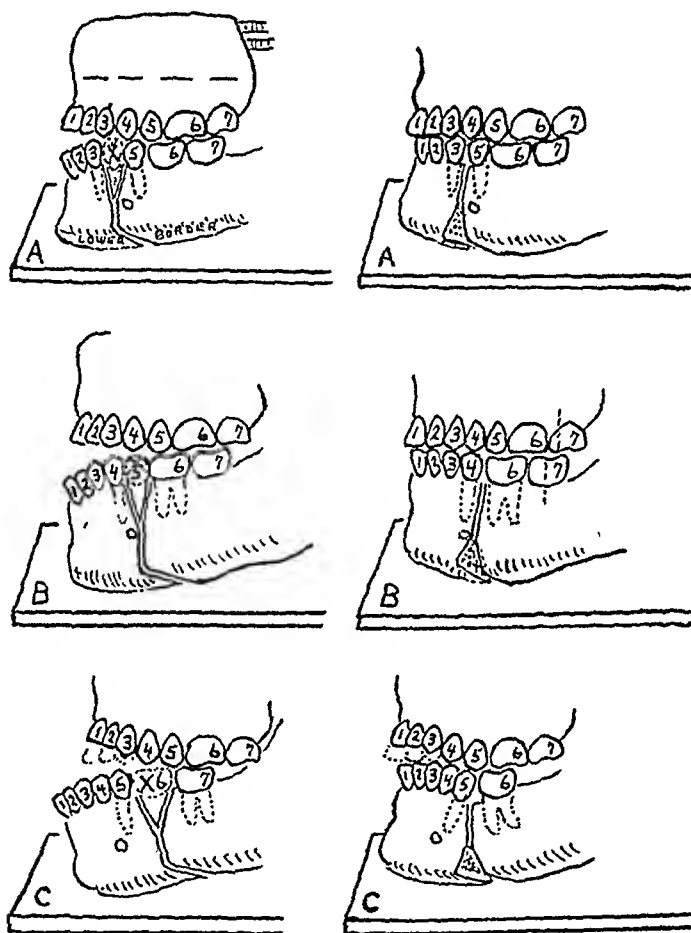

FIG. 5. OPEN-BITE MALOCCLUSION AND PROGNATHISM WITH CONVEXITY OF THE OCCLUSAL PLANE OF LOWER TEETH. GROUP III, *B*

The horizontal position of the upper incisors must be evaluated and if too high, dental restorative bridgework may be necessary to make possible an acceptable surgical result.
A. Occlusal convexity limited to the incisor region. A Y-shaped osteotomy is indicated.
B. Occlusal convexity with moderate prognathism. A Y-shaped osteotomy is indicated.
C. In cases of occlusal convexity with marked prognathism, preoperative consultation with the dentist is necessary. An overriding osteotomy of the ramus together with dental restorations may be more satisfactory than a Y-shaped osteotomy.

tion to determine the size and shape of bone to be removed on each side. In selected cases a long oblique division of the body of the mandible from the buccal posteriorly to the lingual surface will permit elevation of the anterior segment into occlusion with but slight override of the fragments. This can be performed intraorally without any apparent effect on the inferior alveolar nerve.

In the open bite deformity with marked prognathism, a careful evaluation of the dental casts should determine whether removal of (1) sections of bone in the bicuspid-molar region or (2) bone behind the molars or (3) an oblique osteotomy of the ramus is the method most likely to produce the best results.

Exact preoperative determination of the plane of division of the ramus to effect a correction of the deformity without changing the position of the upper condyle fragment requires careful study and evaluation of the effect of repositioning the jaw upon the divided rami. Horizontal sectioning would fail for it is obvious that the division must be oblique from below forward and upward in order to assure contact and union of the fragments and should pass through the safe area described by Hensel. The division should also be oblique from the external surface of the mandible upwards to the internal surface to assure an overriding contact when the mandible is set back and the incisor region raised into occlusion. By predetermining the set-back and establishing it and the override at operation by wiring, one can be certain that the position of the upper condyle fragment has not been changed to any appreciable degree. The slight overriding of the fragments produces no deformity nor postoperative disability.

Patients with cross bite malocclusion and deviation of the chin to one side may also be prognathic to a slight or considerable degree. Those with only slight prognathic deformity may be corrected by an osteotomy of the ramus or by a section from the molar or the retromolar region. Either method will rotate the head of the condyle of the unoperated side, the lateral portion being displaced slightly forward and the inner portion slightly backward and perhaps medially. In two of eight patients for whom we performed a ramus osteotomy, subsequent temporomandibular joint discomfort and disability developed on the unoperated side necessitating splinting to relieve the joint traumatism. Deviation cases with marked prognathism must be operated on both sides by body resection or ramus osteotomy according to the indications for either type of surgery.

It has been stated that a serious disadvantage of osteotomy of the rami and "the one most liable to cause difficulty is the derangement of the muscles of mastication by shifting the insertions of these delicately balanced muscles, throwing them out of harmony with each other which may very seriously interfere with their function."

We have not seen any serious mal-effects in a series of more than eighty such operations—some set back as much as $\frac{3}{4}$ to $\frac{7}{8}$ of an inch and followed up for ten years. Furthermore, this theoretical disadvantage is at complete variance with the experience of orthopedic surgeons who feel that muscles are the most adaptable of tissues and can be lengthened, shortened, and their direction changed, extensors converted to flexors and vice versa with excellent results. While anatomies vary greatly in depicting the direction of the masseter fibers from nearly vertical to very oblique, it is logical to assume that in most prognathic patients the direction of both the masseter and internal pterygoid fibers is more vertical than it would have been in normal occlusion. Making it somewhat more oblique does not throw the muscles out of balance.

Balanced muscular tonus is that which maintains a part in equilibrium under minimum muscular contraction. As applied to the mandible it means the ele-

vator muscles are exerting a pull that exactly balances that of the depressor muscles plus the force of gravity.   Long experience and extensive studies by prosthodontists have demonstrated that muscles overextended and stretched beyond their given length by certain dental procedures will return to that given length at the expense of the tissues of the jaws.   It is said the external pterygoid muscle is of much greater importance in opening the mouth than are the depressor muscles that are apparently more concerned with the support of the floor of the mouth and function of the tongue.   The depressors, however, are able to take on increased activity after arthroplasty or low osteotomy for ankylosis, and their greatly increased activity is striking when patients with ankylosis attempt to open their mouths.

It is of interest to note how thoroughly the depressor muscles of the jaw become relaxed when intermaxillary wiring of the teeth is secure.   In most instances speech is practically normal with the teeth tight in occlusion—far different from the disturbed speech noted when an individual tries to speak when he holds his teeth tightly in occlusion.   When the teeth are secured firmly in occlusion by intermaxillary fixation, it is reasonable to assume the elevator muscles also are completely relaxed.   This coincides with our experience of having only rare displacement complications after osteotomy of the rami has been performed.   In every such instance we have been satisfied some specific error in technique, such as failure of adequate intermaxillary fixation, the use of wire where cast splints were indicated, or lack of effective postoperative observation (in two instances deliberate removal of intermaxillary wiring by the patient) resulted in complications—displacement, recurrence of slight prognathic deformity with or without open bite.

The recurrence of open bite after osteotomy of the rami has been attributed to the action of the masseter and internal pterygoid muscles upon the region of the posteriorly displaced angle combined with lever action fulcrum in the molar region.   This quite probably occurs to some degree, but it seems more likely the external pterygoid muscle might be a greater factor when the upper condyle coronoid fragment has been displaced posteriorly.   It is now accepted that the external pterygoid muscle is the most important factor in the initial opening of the mouth.   We have seen open bite after ankylosis osteotomies become corrected by the development of a quantitative differential contraction of the anterior fibers of the masseter and internal pterygoid muscles.   Similarly in some prognathic cases where osteotomy of the rami was performed, a slight postoperative open bite of 1 or 2 mm. has become corrected in a few weeks' time without any grinding of the occlusion in the molar region.

Of interest is a recent report by Wang-Norderud of 250 patients with prognathism treated by osteotomy of the rami.   He attributes the occasional complication of recurrence of open bite to the pull of the temporal muscle upon the upper fragment, ineffective wiring of the fragments, and insecure or too short a period of immobilization of the jaws.   This difficulty was most evident after operation on open bite cases without prognathism.   To prevent this complication, a second wire is placed far forward to secure good contact of the ramus and coronoid.   It

would seem obvious that in such a large series of cases there would be many where osteotomy of the ramus would definitely be contraindicated, and it is remarkable that reference is made to "the occasional complication."

The author's emphasis on the temporal muscle contraction as the chief factor in displacements seems to be at variance with the function of this muscle. Its forcible contraction occurs in the comminution of food after the teeth have approximated in occlusion. The Smith-Johnson operation for prognathism displaces the coronoid posteriorly against the condyle base and therefore must tend to relax the majority of the fibers of the temporal muscles.

As previously stated, we do not feel one type of surgical technique is indicated for all cases of prognathism or open bite deformity. The proponents of resection of bone in the bicuspid-molar region have overemphasized the complications after ramus osteotomy which we feel can be reduced to a negligible minimum by careful preoperative study and postoperative care. We do not feel it is of great importance to perform a one-stage or a two-stage operation along with recess looping of the mandibular nerve in operations upon the body. While desirable it is not of sufficient merit to warrant the additional operating time involved. Our experience has been that when the divided inferior dental canal is slightly enlarged on either side of the resection, complete regeneration of the divided nerve is the rule.

In cases of prognathic deformity of more than 1 cm. the excision of bone in the molar-second bicuspid region comes so close to the mental foramen that it would seem a simpler procedure to uncover the nerve at the foramen and burr out the bone to expose the canal thereby having the nerve emerge more posteriorly rather than recess looping the nerve so close to the mental foramen. This can be done as a one-stage procedure. In one case where the teeth were missing back of the bicuspids, we carried out this procedure on one side and on the other resected the required amount of bone including the nerve in the bicuspid-molar region. There was no appreciable difference in the time of recovery of sensation on the side of the traumatized nerve and the side of nerve division.

When most of the teeth of the lower jaw are present, the greater degree of prognathism (up to 12-20 mm. of bone) necessitates the extraction of the molar and bicuspid teeth if this region is selected for surgery. In cases of marked prognathism it is obvious that a resection in the third molar or retromolar region will establish much better occlusion with less deformity.

CONCLUSIONS

1. No single method is applicable for the surgical treatment of mandibular prognathism.

2. Such factors as the age of the patient, the number, condition, and potential future service of the teeth are of importance.

3. Most patients have a considerable life expectancy, and the future years of comfortable and efficient dental function should be considered in the selection of the site of division of the mandible.

4. With adequate preoperative study, effective splinting and immobilization,

and adequate postoperative care, complications are rare when ramus osteotomy, retromolar resection, or molar region resection techniques are employed.

5. Procaine is the anesthetic of choice in ramus osteotomy to permit secure immobilization of the jaws before the incisions are closed in order to make sure the fragments are in proper position, usually in butt joint contact.

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METALLIC IMPLANTS AND INTEGRATED
ARTIFICIAL EYES

WENDELL L. HUGHES, M.D.[1]

It has been the aim of every surgeon whose unpleasant duty it becomes to remove the eye of a patient to provide the best cosmetic appearance following the enucleation.

The history of removal of eyes for various reasons goes back many centuries. Prisoners were tortured by having their eyes burned out. Simple enucleation or simple evisceration (in which latter procedure the contents of the eye are removed leaving the sclera) were standard procedures for many centuries. The results were improved by the incorporation of a totally buried implant in each procedure. This provided a stump that was quite moveable and had sufficient bulk.

The artificial eye was then fitted into the socket but the results while fairly good were defective in two main aspects:

A. The entire weight of the prosthesis and most of the weight of the upper lid were supported solely by the lower lid. For that reason the upper lid frequently sagged down leaving a depression below the brow.

B. The motility of the prosthesis was limited mainly because the movement of the stump was not transmitted to the eye itself. There was too much slippage between the eye and the stump. The artificial eye was tilted rather than rotated by the eye muscles. Dimitry attempted to improve the motility by using a buried implant that was tiered on its anterior surface and then had an artificial eye fashioned to correspond. It was not until Ruedemann demonstrated that an implant need not be entirely buried that any real progress was made. Ruedemann sewed the eye muscles to a plastic implant, the front portion of which was a plastic artificial eye made to match the patient's other eye. He originally used tantalum wire sutures. This was reported at the American Ophthalmological Society (in 1945). At that time the present author suggested the use of a tantalum screen wrapped around the form to which the muscles could be sewn, as a means of attaching the muscles to the eye. This is the present form of eye that is used by Ruedemann. It has the serious drawback that if it needs to be changed for any reason, it requires a surgical operation. The eye may be slightly out of line vertically or horizontally, sometimes the position changes late after operation, there may be some exophthalmos or enophthalmos or the color of the iris may fade, the size of the pupil may not match the normal eye, it may become scratched etc. For these reasons several integrated implants have been introduced, stimulated by the work of Ruedemann, in which the eye muscles are sewn to an implant in which there is a depression on the anterior surface. A replaceable artificial eye with an integrating peg on its posterior surface is then fitted to the permanent implant. The eye is supported by the implant rather than by the

lower lid, and the movement of the implant is transmitted to the artificial eye without loss such as occurs when a buried implant is used.

The different models of the implant are useful for several procedures;

1. *Enucleation.* The type of integrated enucleation implant which will be shown in the movie is made in the form of a thin hollow Vitallium[2] ball with a ring around it to which the eye muscles are attached.

The entire eye is removed, carefully dissecting the tendon of each of the rectus oculi muscles. These are then passed around the bar with as much fascia as possible and sewn back to themselves. The conjunctiva is sewn around the anterior face of the implant leaving it exposed (fig. 1, B).
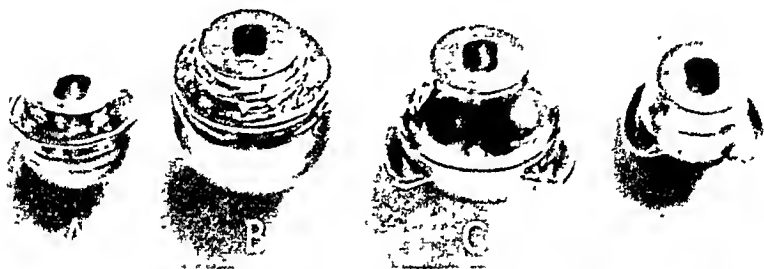

FIG. 1. INTEGRATED VITALLIUM IMPLANTS FOR USE WITH INTEGRATED ARTIFICIAL EYES

a. Small type with 12 mm. body for use late after enucleation.
b. Enucleation type for use at the time of enucleation.
c. Evisceration type with anchor bars posteriorly 18 mm. body.
d. Small evisceration type with anchor bars posteriorly.
All of these implants have a flat face with depression anteriorly to receive the peg on the posterior surface of the artificial eye.

2. *Replacement late after enucleation.* When it is desired to use the integrated type of eye and implant to replace the ordinary artificial eye a smaller model similar to the enucleation implant is used (fig. 1, A). The eye muscles and fascia are separated into four divisions representing the four recti muscles and are similarly sewn around the attachment bar with as much fascia as possible and the conjunctiva treated as in the enucleation procedure.

This is applicable whether or not a buried implant had been used previously.

3. *Evisceration.* The new type of evisceration implant has two anchor bars posteriorly (fig. 1, C and D).

The evisceration is done in the usual manner by removal of the cornea and the anterior opening is enlarged by two radial incisions obliquely situated opposite each other to allow the insertion of either the 18 mm. or the 12 mm. implant. Two incisions are made near the posterior pole to allow for the insertion of the anchor bars through the sclera.

[2] Vitallium—product of the Austenal Laboratories, 226 E. 39th St., N. Y. C.

In this procedure the muscles are not detached and the motility of the implant is similar to that of the eye prior to operation   The extra ocular muscles can of course be adjusted to correct any previous strabismus present

Integrated with each of these implants a plastic artificial eye is used on which a peg is placed in the desired location to give the proper position, and the eye can be made thicker or thinner to match the fullness of the normal eye   The implant remains permanently in place but the eye can be removed and changed at will

The support provided for the upper lid and the motility of the artificial eye are particularly noticeable in the pictures

SUMMARY

Integrated implants and artificial eyes which provide an improved cosmetic appearance both static and dynamic are described

The construction of hollow metal is such that there are no crevices in which infection can gather as in the case of some implants in which there are separate parts of metal and plastic combined   There being no plastic of any kind in the implant, reactions from buried plastic are avoided

It is too soon to report permanent results since the first of these implants was put in only two years ago   It will be ten years before results can be definitely evaluated   Some extrusions have occurred but the results are so much better than formerly that they are quite encouraging   Even if extrusion of the implant does occur, it is not serious as the usual buried implant can always be put in at any time

A satisfactory stock eye can frequently be chosen from the standard set of monoplex eyes provided by the American Optical Company

REPAIR OF DEFECTS PRODUCED BY EXCISION OF TUMORS IN THE EYE REGION[1]

KERWIN M. MARCKS, M.D.

Tumors in the eye region offer the same problems and should be treated in the same manner and with the same respect as superficial tumors elsewhere and that is by complete radical removal in all dimensions, thus making an attempt to eradicate the lesion at the first treatment. This was particularly stressed by Webster (1). Irradiation, Desiccation, and other methods will not enter into this discussion since the cases presented are those in which the tumor was removed with Sealpel Surgery. It is the only type, in our opinion, sufficiently safe to use in this location. It offers minimal risks to important structures, keeps the operative field visualized at all times, and makes possible the removal of the tumor in its entirety. It is true that a large majority of cases that come to our clinic are post-irradiated. Frequently, we have no history of the intensity of irradiation or other factors that enter into the treatment so that we're not in a position to condemn irradiation in the treatment for this particular type of tumor. We also receive post-desiccated, post-coagulated, and post-operative cases so that again none of us are in the position to criticize and to be dogmatic about a particular type of treatment employed. For this reason, it is desirable to have a congenial group of specialists available in order to participate in making proper diagnosis and in suggesting the proper treatment. Fortunately, we operate this type of clinic at our hospital. We can only make a plea to the effect that if we do not see the tumor initially, we inherit it before it has gone beyond the curative ftage.

None of us are perfectionists, but we are always striving towards a goal of persection. That is why we should all unhesitatingly co-operate in an attempt to apply the knowledge available to the best interests of the patient. No man is too old to accept the evaluation of principles adopted by the young and no man too young to respect and to benefit by the experiences and adopted principles of the old.

BIOPSY OF TUMOR

The safest biopsy of a tumor is the tumor itself with an addition of goodly portion of normal skin and subcutaneous tissue. In cases of long duration, muscle bone, mucous membrane, and adjacent structures may have to be sacrificed.

The surgeon should leave the operating room with reasonable assurance that he has completely eradicated the tumor with minimal risk to the patient and damage to important structures. The cosmetic factor should be taken into consideration but not at the sacrifice of improper removal of the tumor. With these principles in mind, I will attempt to present a variety of cases showing the results of various procedures. It is an attempt to portray the type of lesion, the radical excision, and the primary repair.

PRIMARY REPAIR OF DEFECTS

Primary repair should be instituted in all surgical excisions of tumors in the eye region. In radical excision, there is bound to be some surface that should be covered immediately. There is no reason for delayed procedure since observation of an open wound in order to see whether there will be a recurrence is not essential. The economic factor and the possibility of secondary infections are alone sufficient to warrant the closure of these raw surfaces

MATERIAL OF CHOICE

1. The logical material of choice should be, of course, adjacent skin. This is practical as regards the small lesions, especially if they show no evidence of super-
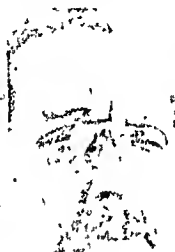

Fig 1   Fig 2   Fig 3
CASE I

... with involve
complete ex
the lacrimal
d split graft
applied

Fig 2 shows appearance of region approximately 14 days postoperatively
Fig 3 shows condition 6 months following operation. No evidence of recurrence. Patient has no desire to have further surgery done at this time

ficial ulcerations. In the small ulcerated lesion, it is still questionable whether there should be any undermining of the adjacent skin in order to close the wound by approximation of the skin edges. I would feel much more secure in applying a free graft temporarily.

2 Shifting of flaps into defects. This is the next ideal method of approach to the covering of the defect. This covers either the immediate flaps or flaps previously prepared.

3 The application of a free graft either split or full thickness, cut either before or after excision of the tumor. In the case of a split graft, we would prefer to use it as frequently as possible in the form of a dressing graft. If we cut the graft after excision of the tumor, we make a complete sterile change in the operating room and do not touch the eye region until the tumor area is dressed. I do not feel that we should use adjacent tissue as a primary repair as long as the appli-

FIG 4   FIG. 5

CASE II

Fig. 4 shows Basal Cell lesion 9 years duration. Irradiation at intervals with regression of the mass. Repeated ulcerations. Operation consisted of excision of the mass including $\frac{2}{3}$ of the lower lid and approximately $\frac{1}{2}$ of the upper lid, together with periosteum and bone in the anterior part of the medial wall of the orbit. Orbital contents again retracted laterally, periosteum elevated on inner orbital wall, and bone examined. Palpebral conjunctiva of both lids approximated. A split graft from the left arm was then applied over the raw area with pressure. (Complete sterile change prior to removal of graft)

Fig 5 shows immediate post-operative photograph. Suture inserted in upper lid for lateral traction

FIG. 6   FIG. 7   FIG 8

CASE II—CONTINUED

Fig. 6 shows condition on 9th post-operative day. Discharged 11th post-operative day with wound completely covered.

Figs. 7 and 8 show condition after separation of both lids and advancement of the lateral elements of the lids medially towards the inner canthal region in the form of sliding flaps.

cation of a free skin graft is practical.   Instruments used in excision of the tumor should be discarded and re-sterilized.   In preparation of the area for excision of
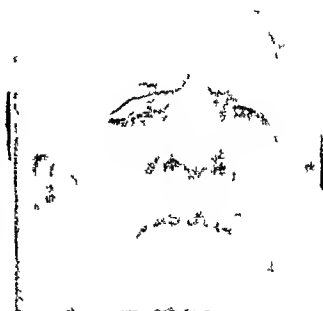
Fig 9

Fig 10

CASE III

Fig 9 shows a squamous cell carcinoma of lower lid. The operation consisted of complete excision of the lower lid and immediate application of the Hughes (4–6) Procedure for primary repair

Fig 10 shows the condition 7 days postoperatively with the skin of the lower lid supplied by advancement from the cheek

Fig 11

Fig 12

CASE III—CONTINUED

Fig 11 shows condition after release of lids. There is a definite ectropion the result of insufficient skin previously advanced from cheek

Fig 12 shows the final result following application of a right supraclavicular full thickness graft to lower lid

FIG 13   FIG. 14

CASE IV

Fig 13 shows ulceration, a basal cell carcinoma involving left lower eyelid and skin of cheek and inner canthal region   History covers period of 10 years beginning with small pimple.   Radium treatment 4 years ago which did not seem to heal the area   Patient also had a +4 Wassermann which complicated the diagnosis.   Approximately ½ of the mucous membrane of the lower lid appeared uninvolved   Under novocain anesthesia, the lower lid, skin of the cheek, and inner canthal region was excised, left approximately ⅓ of the mucous membrane   A lid splitting operation was performed utilizing the remaining mucous membrane   A split graft was removed from the left upper arm and sutured in place over the raw area

Fig 14 shows condition 7 days post-operatively, graft intact, local condition satisfactory
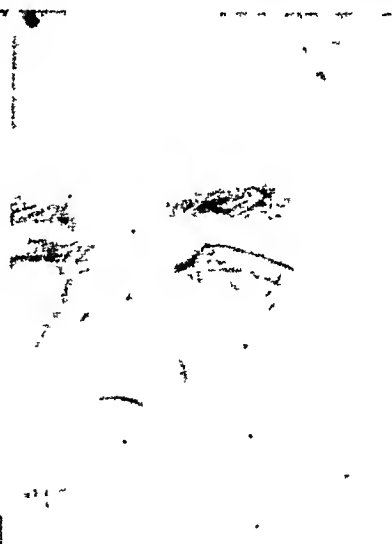

FIG. 15   FIG. 16

CASE IV—CONTINUED

Figs 15 and 16 show condition after release of lids.   Fig. 15, eye open and fig .16, eye closed

182

Fig 17   Fig 18

CASE V

Fig 17 shows a fungating ulcerated mass with a diagnosis as a basal cell carcinoma involving the inner canthal region and approximately the inner portion of both upper and lower lid. Under local novocain anesthesia the entire ulcer area was excised including a goodly portion of normal tissue. The left nasal bone and portion of the left frontal process of the maxilla were discolored. This section was removed preserving the nasal mucous membrane. However after removal of the bone the nasal mucous membrane showed evidence of pathology. This area was excised. The palpebral conjunctiva of both lids were approximated.

Fig 18 shows extent of excision immediately post operatively. A split graft from the right arm was applied over the raw area as the dressing graft

Fig 19   Fig 20   Fig 21

CASE V—CONTINUED

Fig 19 shows complete take of graft with nasal bone and base of frontal process of maxilla exposed

Fig 20 shows condition approximately 2 months later with application of a forehead flap to cover defect

Fig 21 shows condition about 4 weeks after readjustment of the pedicle

the tumor, as much time as possible should be devoted to the area surrounding the tumor rather than the tumor itself. I realize these principles are not too practical in tumors about the eye region, but I still feel it justfiable to observe
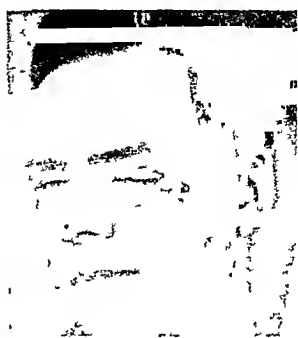

FIG. 22   FIG. 23   FIG. 24

CASE VI

Fig 22 shows condition of patient in 1933 with a large apparent pigmented mole, left side of face. According to history, he had excisions of the area with various skin graft operations.

Fig. 23 shows a photograph of his condition in 1945. The tumors about the eye were firm, irregular, non ulcerated, but very suspicious of beginning malignancy. Primary excision including approximately ⅓ of the lower lid and the tumor visible in the skin of the upper lid   Tarsorrhaphy performed and the raw area covered by a flap from the upper lid.

Fig 24 shows condition after the above procedure. The biopsy report was basal cell carcinoma on all specimens. It was decided to follow through on partial excision and advancement of skin from the left lower cheek with local excision of the tumor masses.

FIG. 25   FIG. 26   FIG. 27

CASE VI—CONTINUED

Figs. 25 and 26 show the results of these procedures. A scalp flap for side burns was then planned and transferred as seen in fig. 27.

Fig. 27, a portion of the distal end of flap was utilized as a free eyebrow graft and the edges of the scalp flap approximated with the advanced edges of the cheek flap.

minute details in the preparation. We are still dealing with a vicious dog and we might as well try to prevent reaching out to be bitten. By the use of these simple procedures, secondary definitive treatment is frequently avoided.

The patient has a short convalescence with no open wound to be dressed repeatedly, and as I mentioned before, subjected to the possibility of infection This still gives us the opportunity of observing the area for recurrences

In some resulting lid defects, the situation, naturally, becomes more involved The various lid splitting operations, when able to be utilized, are the methods of choice. As long as we can resurrect, even a small portion of mucous membrane, these procedures are indicated. This field of repair has been well covered by various authors and I shall not attempt to go into detail about the methods employed I agree with Sherman (2-3) that the choice should be simple instead of complicated. I will attempt to illustrate a few cases utilizing a few of these

FIG 28
CASE VI—CONTINUED

Fig 28 shows the result following the flap advancement in the scalp, adjustment of the
on of considerable scar tissue The eyebrow graft as seen is
s remaining after
ining scar tissue
not available at
this time

methods I can only make one suggestion as regards this splitting procedure and would recommend that free grafts be applied to the raw surface of the lower lid in preference to advancement of the skin from the cheek, since all too frequently skin grafts will have to be applied at a later date

As cavities are exposed due to the necessity of removing bone in this region, the best primary treatment and still the best method employed, is suturing mucous membrane to skin or mucous membrane to periosteum or skin to periosteum to mucous membrane

As regards the transfer of flaps, local or previously prepared, it might be well to satisfy ourselves that there will be no recurrence since after the application of a heavy flap, observation for extensions becomes exceedingly difficult.

SECONDARY REPAIR OF DEFECTS

This subject involves a distinct entity of its own and I will attempt very little discussion since it has been widely and excellently covered by the following: Blair, V. P., Moore, S., and Byars, L. T. (7), Reese, A. B. (8), Blair, V. P., Brown, J. B., and Hamm, W. G. (9), Wheeler, J. M. (10), Spaeth, E. B. (11–12), Young, F. (13), Sugar, H. S. (14), Dupuy-Dutemps, L. (16), Saint Martin, M. (17), Smith, F. (18), Landolt, (19–20), Dupertius, S. M. (21), and many others. If desirable, these above methods could all be utilized in the primary repair of some of these lesions.

The method used by Armstrong and Garcia (15) may offer a great deal of advantages. Unfortunately, I have not had the opportunity of using it. I would like to present two cases in order to illustrate. The one, showing a utilization of a forehead flap in repair as frequently seen and the other, utilizing a combination of different methods of repair.

SUMMARY

I wish to apologize for repetition on a subject widely discussed and extensively written about. However, I am convinced that review is absolutely necessary. I have attempted, particularly, to lay stress on the following:

1. The importance of close co-operation of the various specialists in the diagnosis and treatment of these lesions.

2. The necessity of completely removing the tumor in all dimensions.

3. Attempt to disturb as little as possible the skin and subcutaneous tissue adjacent to the defect after removal of the tumor.

4. Importance of primary covering of the defect.

5. Secondary repair after relative assurance that there will be no recurrence or extension of the initial lesion.

I may have stressed the tumor factor a great deal more than the title would indicate, but I felt justified in that there exists such an important relationship between the Excision and the Repair.

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THE REPAIR OF FULL-THICKNESS CHEEK DEFECTS FOLLOWING IRRADIATION NECROSIS

ROBERT H. IVY, M.D.[1]

Irradiation treatment of malignancy of the mucosa of the mouth and adjacent structures, while occasionally resulting in cure of the disease for which it was used, is frequently followed by necrosis of the bone and healthy soft tissues around the lesion. After a long waiting period, separation of the soft tissue slough and bony sequestrum takes place, with the result that an opening is left through the cheek into the floor of the mouth, the nose or the maxillary sinus, depending on the location of the original site of the lesion treated. In defects involving the lower jaw particularly there is interference with the function of mastication, due to displacement of mandibular fragments, great discomfort from leakage of saliva and food through the opening, and marked visible deformity. Where the defect is in the upper jaw and cheek, leakage of food and saliva is not so noticeable, but speech may be markedly affected and a serious visible deformity exists.

For these reasons, surgical restoration of the missing soft tissues and if possible the bone is highly desirable. The effects of irradiation on the tissues present difficulties in repair that do not exist in cases of purely traumatic origin, and the age of the patient is another factor that frequently precluded extensive and prolonged operations.

Sometimes one must be content with a closure of the leak from the mouth, without regard to cosmetic improvement or restoration of bony loss. Under favorable circumstances it may be possible to close the opening, improve the appearance and restore the function of mastication by filling in the gap in the bone.

A fundamental principle to be followed in the correction of full-thickness defects is the restoration of lost lining as well as outer skin covering. Attempts to close an opening of this kind by application of a flap with raw surface exposed in the mouth, nose or maxillary sinus, will seldom be successful unless the opening is very small. Infection of the exposed raw surface will occur, followed by shrinkage of the flap from scar contracture and persistence of the leak. Furthermore, if a bony defect is to be filled, it is absolutely essential that an adequate soft tissue bed be provided, with good epithelium inside and out, for reception of the bone graft.

In defects of any extent, the outer covering must be provided by a pedicled flap from the neck, chest or other suitable source. The lining must usually be formed of skin, preferably non-hair bearing, to replace the lost mucous membrane. These necessities can be furnished in several ways:

1. By previously epithelializing the under surface of the end of a pedicled flap to be used for the outer covering of the defect. This has the disadvantage of not

providing sufficient thickness of subcutaneous tissue, particularly if bone is to be implanted later

2 By folding the distal end of the pedicled flap so that skin covers both inner and outer surfaces This is especially useful for lining marginal defects near a natural opening such as the nostril or the mouth orifice

Fig 1 Case I Hole in left cheek due to loss of bone and soft tissues following irradiation necrosis

Fig 2 Case I Opening in anterior part of hard palate

3 Flattening the end of a tubed pedicle by removal of subcutaneous fat, and suturing it over the defect so that one side of the flattened end faces in and the other side out

4 Turning over a flap with its base at the margin of the defect, so that the skin surface faces inside to form the lining and then covering the whole resulting

raw area with another pedicled flap. This is a satisfactory way to furnish lining, provided the skin surrounding the defect is of good quality and free of hair, and

FIG. 3. Case I. Tube pedicle flap across neck, used to close opening in left cheek

FIG. 4. Case I. Right end of neck tube detached and sutured into cheek defect after epithelialization of raw surface with split skin graft.

has a good blood supply from the margin of the defect. The lining flap should be raised at the time the pedicle of the covering flap is made, and sutured back in its original bed for delayed transfer when the covering flap is applied. This

Fig 5 Case I Final result of repair of cheek defect

Fig 6 Case II Exposed necrotic bone of right malar and maxilla through opening in cheek

method of formation of a lining may not be successful in cases where the circulation of the skin surrounding the margins of the defect has been impaired by previous heavy irradiation

5 Forming lining and covering from the same tube pedicled flap ("loop principle") One end of the tube is first detached and sutured to one edge of the

FIG. 7. Case II. Defect in cheek, hard palate and nasal septum after removal of dead bone. Below, tube pedicle flap from side of body used in repair.

FIG. 8. Case II. Lower end of tube pedicle brought up to close defect in cheek, after flattening by excision of fat to provide lining and covering.

defect. After blood supply is assured through this end the other end of the tube is then brought up to the opposite edge of the defect, forming a loop. At a subsequent stage the loop is divided in the middle, the tubed flaps are opened out and

FIG. 9. Case II Other end of tube pedicle sutured into large defect of hard palate after similar flattening.

FIG. 10. Case II. Loop later divided, excess removed and edges sutured to close defects in palate and cheek. Shows complete closure of large opening in hard palate by double surfaced skin flap

one part sutured to face inward and form the lining and the other part the covering. This method is particularly applicable in cases where the skin immediately surrounding the defect is unsuitable for lining by reason of irradiation damage or presence of hair.

FIG. 11 Case II Upper artificial denture inserted

FIG 12. Case II Final appearance   (Figs 6 to 12 inclusive, illustrating Case II, have already appeared in Surgery, 15: 56–74, 1944, and are reproduced by permission of the publishers, The C V Mosby Company, St Louis)

FIG. 13. Case III Defect in soft tissues and mandible, permitting escape of food and saliva.

FIG 14 Case III Preparation of tube pedicle on chest for repair of defect
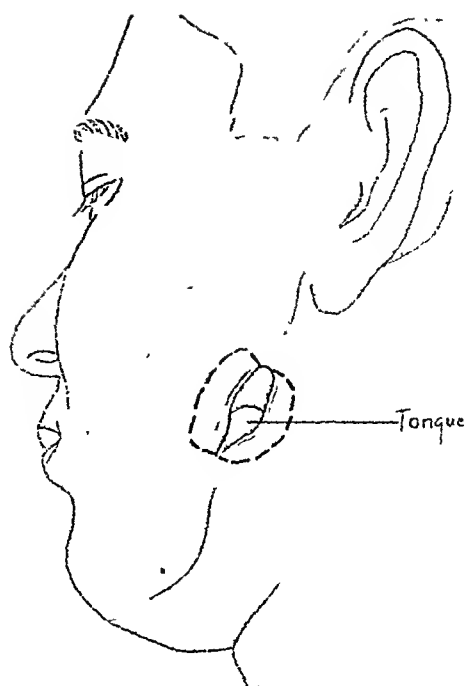
Fig. 15. Case III. Outline of skin flap on either side of defect to be turned in to form mouth lining.

Fig. 16. Case III. Local lining flaps sutured together with skin facing into mouth, raw surface out.

Fig 17 Case III End of chest pedicle sutured to cover outside of defect

Fig 18 Case III Closure of defect completed after connection of pedicle with chest has been severed

Some of the foregoing methods are illustrated by the following cases

Case I is an example of formation of lining by epithelialization of the under surface of a pedicled flap with a split thickness skin graft The patient was a 35 year old woman who

had had extensive irradiation of the upper jaw for a carcinoma starting in the mucosa of the anterior part of the hard palate on the left side. Tissue destruction left an opening in the anterior part of the hard palate and a large hole in the left cheek at the side of the nose into the maxillary sinus (figs. 1 and 2). For a time she wore a very well constructed prosthetic piece to supply missing teeth, close the opening in the palate and cover the hole
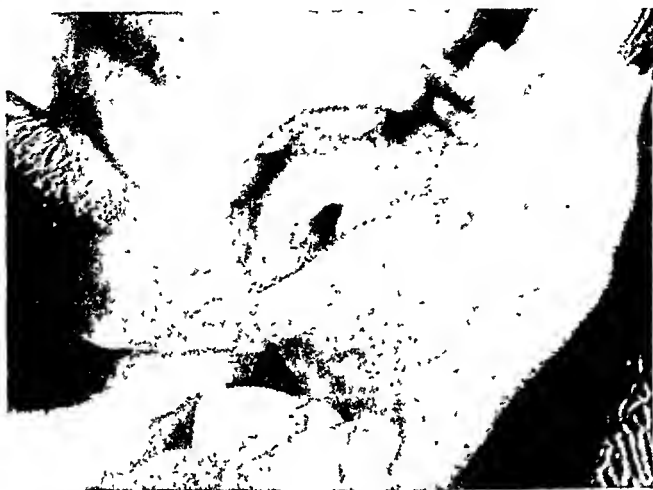

FIG. 19. Case IV. Necrosis of ascending ramus and body of mandible following irradiation for carcinoma of cheek.

FIG. 20. Case IV. Defect after removal of sequestrum with large communication into oral cavity. Opening surrounded by scar and irradiated tissue.

in the cheek. But she desired a surgical closure of the external opening, and this was achieved in several stages, using a tubed pedicle flap from across the neck (fig. 3). Figure 4 shows the right end of the neck tube detached and sutured into the cheek defect after previous application of a split-thickness skin graft to its under surface for lining. Figure 5 shows the final result. The patient wears an artificial denture to supply the missing teeth and cover the hole in the palate.

Case II illustrates the method of forming lining and covering by flattening the end of a tubed pedicle by removal of subcutaneous fat, and suturing it over the defect so that one side of the flattened end faces in and the other side out. This case has already been re

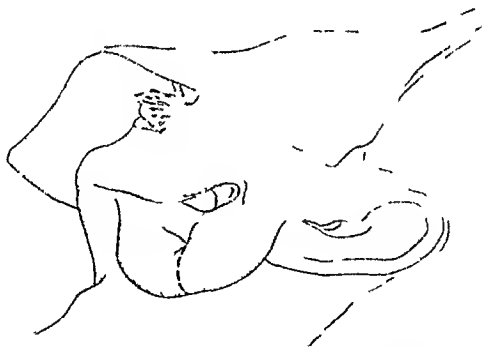FIG 21 Case IV Tube pedicle from chest with ends attached to anterior and posterior margins of defect

FIG 22 Case IV Diagram showing line of incision through looped pedicle to form two sections

ported in a paper published in Surgery 15 56-74, 1941 Three years before applying for repair, this 25 year old girl had been treated by extensive irradiation for carcinoma of the right maxillary sinus As a result of this treatment the soft tissues of the cheek sloughed, exposing the necrotic malar and maxillary bones on the right side (fig 6) No evidence
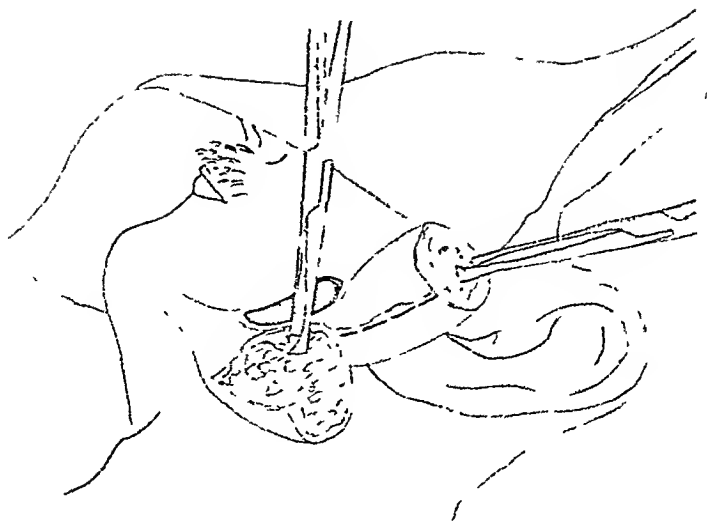
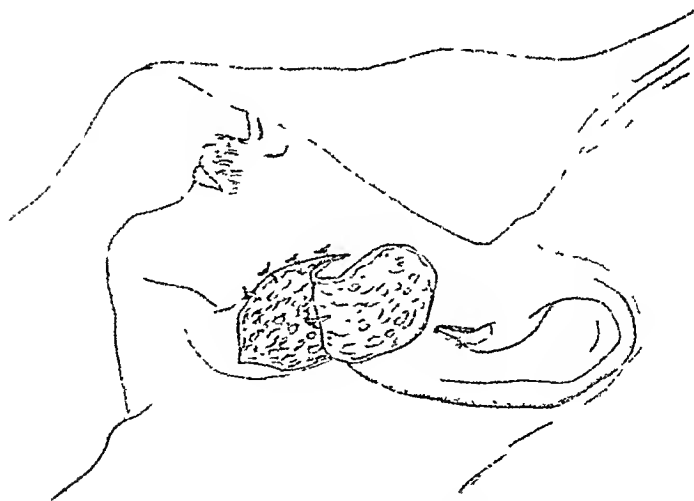FIG. 23. Case IV. Lining part of flap opened out.

FIG. 24. Case IV. Lining part of flap sutured with skin facing mouth. Covering part of flap opened out.

of the original malignancy remained. At a preliminary operation a large sequestrum was removed, comprising most of the right malar and maxilla, including the palatal and alveolar processes and the teeth attached, as well as the septum of the nose. This left a large open-

ing in the right cheek, into the maxillary sinus and nose, and a defect comprising the entire right side of the hard palate. A long thoraco-epigastric tube pedicle was prepared (fig 7). At a subsequent sitting the distal end of the flap was severed and after freshening the edges of the opening in the cheek the end of the tube was flattened out by excision of intervening fat to create two surfaces of skin, one being sutured to the edges of the defect facing in to replace the lining of the outer wall of the maxillary sinus and the other facing out to replace the lost external skin (fig 8). Later the flap was cut loose from the chest and the free end was in turn thinned out to form two skin surfaces which were then sutured into the palatal defect, forming upper and lower layers (fig 9). The tubed flap, which now had one end on the cheek and the other in the palate was next divided where it emerged from the mouth. The freshened ends were trimmed to fit the remaining free edges of the cheek and mouth defects respectively and sutured in place (figs 10 and 11). The marked defect in speech was immediately overcome after operative closure of the opening. After

Fig 25 Case IV Posterior end of flap sutured to cover defect

two or three minor operations to thin out and shape the cheek flap an artificial denture was made. Figure 12 shows the completed case.

Case III illustrates the formation of a lining by turning over flaps based on the margins of the defect so that the skin surface faces inward. A 45 year old man had had extensive irradiation 3 years previously for an alleged carcinoma of the posterior part of the left lower jaw region. This treatment was followed by sloughing of the soft tissues and bone, leaving a large opening in the lower part of the cheek through which food and saliva escaped freely and the tongue could be seen (fig 13). There was also a gap of about 1 inch in the posterior part of the mandible. The main object of surgical repair was closure of the opening to prevent leakage of fluid and food and to permit the patient to discard an external dressing. At the first operation a tubed pedicle was prepared on the upper part of the left side of the chest (fig 14). At the same time two flaps based on the margins of the defect were raised to form a lining and sutured back in their original place (fig 15). About four weeks later the flaps were again raised from the borders of the cheek defect, turned

ASSOCIATED CONGENITAL DEFECTS OF THE EARS, EYELIDS AND MALAR BONES (TREACHER COLLINS SYNDROME)

CLAIRE L. STRAITH, M.D., Detroit, Mich., AND JOHN R. LEWIS, M.D.,* Atlanta, Ga.

The classical syndrome of congenital symmetrical notching of the outer third of each lower lid and deficient malar bones was first described by the London Ophthalmologist, E. Treacher Collins, in 1900. He reported two cases, and in England the syndrome is now referred to as the "Treacher Collins Syndrome" (fig. 1).

Apparently no further cases were reported until 1943 when one case each were reported by Ida Mann and T. P. Kilner in the British Journal of Ophthalmology. Miss Mann's case revealed no notching of the lower lids, but did reveal the inner three-fourths of each lower eyelid to be thin and atrophic with an absence of eyelashes and meibomian glands. It was evident that the lower bony margins of the orbits were defective and the cheeks depressed. The external ears were normal, but there was bilateral deafness. Mr. Kilner's case revealed oblique palpebral fissures with a peculiar angulation of the lower eyelids and a collection of eyelashes at the junction of the outer and middle thirds. There were deep depressions in the infraorbital regions. There was a cleft of the soft palate. The external ears were grossly deformed; the external auditory meatuses absent, and there was bilateral deafness.

So far as the authors have been able to determine, there have been no reported cases in the literature of this country and no other case reports in the foreign literature.[1] We would like to add five cases which are at present under treatment at this Clinic. These cases are of particular interest in view of the fact that they consist of a mother and her four children (fig. 2). In each of the previously reported cases there has been a negative family history.

The father, S. J. B., is 43 years old and appears to be normal. His family history is negative (fig. 2).

Case 1: The mother, A. T. B., is 37 years old and has a negative family history. On examination it is noted that the palpebral fissures are oblique, slanting downward laterally,

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[1] Since submission of this paper for publication, attention has been drawn to an abstract in Excerpta Medica, Sect. IX, Vol. 1, No. 1, Sept., 1947, p. 35, by A. Franceschetti and P. Zuahlen, of an article entitled Dysostosis Mandibulo-Facialis: a New Syndrome, which originally appeared in Bulletin der Schweizerischen Akademie der Medizinischen Wissenschaften, 1944: 1–2, 60–66. The authors describe certain anomalies of the eyes, ears and face observed in a nine year old French boy. The palpebral fissures were directed obliquely and both lids showed small colobomas at each angle. The lower lid was sharply angled at the junction of the middle and outer thirds. The external ears were malformed and microstomia was present. The hard palate was highly arched. There was hypoplasia of the cheek bones and of the lower jaw giving the face a fish-like or bird-like profile. A photograph of the case is included, which shows that it does not differ in any essential manner from those previously described by Treacher Collins and Kilner, although the Swiss authors claim that the cases reported by the two British writers are atypical. In addition to mentioning three 'abortive' cases reported in the literature and describing one of their own with unilateral microphthalmia, Franceschetti and Zuahlen have collected seven typical cases and have evolved   name for the condition. While the new name may be applicable,   : we cannot ?   authors have discovered a new syndrome, and all credit   still belong to   ollins for being the first to describe the condition (Ed.).

FIG 1 THE CASE SHOWN IN TREACHER COLLINS' ORIGINAL PAPER IN 1900
(Trans Opthal Soc United Kingdom Vol XX 1900)

FIG 2 THE FATHER APPEARS NORMAL THE MOTHER AND FOUR CHILDREN EXHIBIT
THE SIGNS OF TREACHER COLLINS SYNDROME

FIG. 3. CASE 1

The mother—notice the abnormally formed ears, underdeveloped malar bones, notches of the lower lids, receding chin, and narrow maxillary arch with prominent upper front teeth.

FIG. 4. CASE 1

Notice the absence of eyelashes in the medial ½ of the right lower lid and the shallow notches of both lower lids.

Fig 5 Case 2

Notice the depressed area below and lateral to each eye, the notching of the lower lids, receding chin, abnormal ears

Fig 6 Case 2

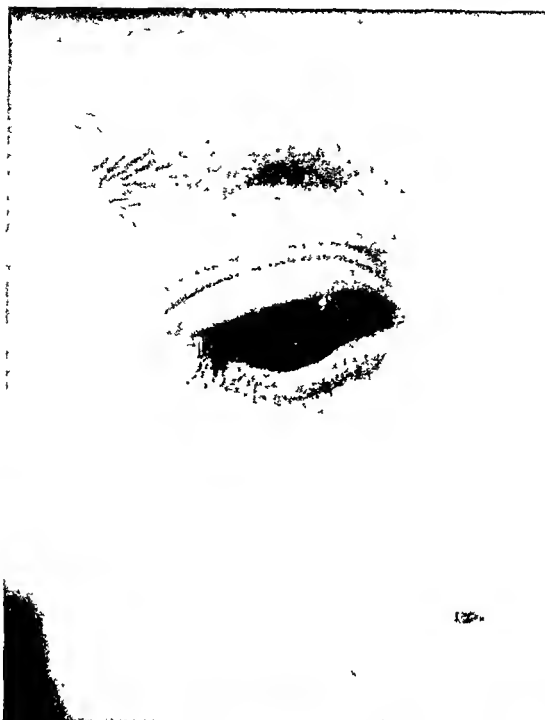Notice the notching of the lower lids The eyelashes are present

FIG. 7. CASE 3
Note the absence of eyelashes from the medial $\frac{2}{3}$ of the lower lid.

FIG. 8. CASE 4
There is a deep depression below and lateral to each eye; the ears are deformed, chin receding, palpebral fissures oblique.

CHART I

Case	Lower Orbital Margin	Palpebral Fissure	Eyeball	Lower Eyelids	L. Eyelashes (Medial Lower Eyelid)	External Ear	Ext. Auditory Meatus	Hearing	Maxilla	Mandible	Other Abnormalities
	Flattened; Deficient	?	? axis	Bilateral notch	Col'n of lashes at ⅓ distance to lateral commissure	Bilaterally deformed	Absent	Deaf	High, narrow	?	?
	Flattened; Deficient	?	? axis	Thin & atrophic	Bilaterally absent	Normal	Normal	Normal	High, narrow prominent front teeth	Receding chin	?
case 2	Flattened; Deficient	Oblique (Downward laterally)	Normal axis	Unilateral notch	?	Normal	Normal	Normal	High, narrow prominent front teeth	Receding chin	Long second metatarsal bone
case 3	Flattened; Deficient	Oblique	Oblique axis?	Bilateral Notches	Absent on rt. space lid	Bilaterally deformed	Absent	Deaf	High, prominent front teeth	Receding chin	Long 2nd metatarsal, flat parieto-occip. skull, flat parieto-occipital skull; hyper-motility; metatarpo-phalangeal jts.
	Flattened; Deficient	Oblique	Normal axis	Bilateral Notches	Normal	Slightly deformed bilaterally	Deficiency helix bilaterally	Partially deaf	High, narrow prominent front teeth	Receding chin	Long 2nd metatarsal; hyper-motility of metatarpo-phalangeal joints
	Flattened; Deficient	Oblique	Normal axis	Bilateral notches	Absent medial rt. lower lid	Bilaterally deformed	Unilaterally absent	Unilateral Deafness	Prominent upper front teeth	Receding chin	Cleft palate
	Flattened; Deficient	Oblique	Normal axis	Bilateral notches	Bilaterally absent	Bilaterally deformed	Absent	Deaf	High, narrow prominent front teeth	Receding chin	Long second metatarsal bone
	Flattened; Deficient	Oblique	Normal axis	Normal	Bilaterally absent	Bilaterally deformed	Normal	Normal	Narrow	Receding Chin	None
	Flattened; Deficient	Oblique	Normal axis	Bilateral notch	Bilaterally absent	Bilaterally deformed	Normal	Normal	High, narrow prominent front teeth	Receding chin	Same as above

had only the deficient lower eyelids and are not included.

CHART I

CASES OF TREACHER COLLINS SYNDROME*	MALAR EMINENCE	LOWER ORBITAL MARGIN	PALPEBRAL FISSURE	EYEBALL	LOWER EYELIDS	EYELASHES (MEDIAL ⅓ LOWER EYELID)	EXTERNAL EAR	EXT. AUDITORY MEATUS	HEARING	MAXILLA	MANDIBLE	OTHER ABNORMALITIES
Treacher Collins Case 1	Flattened	Deficient	Oblique (Downward laterally)	?	Bilateral Notches	?	Normal	Normal	Normal	?	Receding Chin	?
Case 2	Flattened	Deficient	?	?	Unilateral notch	?	Normal	Normal	Normal	Narrow	Receding Chin	?
Idu Mann's Case	Flattened	Deficient	Oblique	Normal axis	Thin & atrophic	Bilaterally absent	Normal	Normal	Normal	High, narrow prominent front teeth	?	?
T. P. Kilner's Case	Flattened	Deficient	Oblique	Normal axis	Bilateral notches	Col'n of lashes at ⅓ distance to lateral commissur	Bilaterally deformed	Absent	Deaf	High narrow	Receding chin	Cleft palate
The authors' cases: A. T. B. (Case 1)	Flattened	Deficient	Oblique	Normal axis	Bilateral notches	Absent medial rt. lower lid	Slightly deformed bilaterally	Deficiency helix bilaterally	Partially deaf	High, narrow prominent front teeth	Receding chin	Long second metatarsal bone

CONCLUSION

A review of the literature has revealed four reported cases of "Treacher Collins Syndrome" in England and none in America. Five cases have been described by the authors and a brief discussion of the embryology and etiological factors has been given. Also, in brief, the recommended plastic surgical treatment has been suggested.

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1. Collins, E. T.: Trans. Ophthal. Soc. United Kingdom, XX: 90, 1900.
2. Mann, I., and Kilner, T. P.: British J. Ophthal., 13, Jan. 1943.

that the diets of the mothers are insufficient in 40% of the cases, and that malformed children are born more often to older mothers than to young ones. He concludes, however, that congenital malformations arise solely from influences which affected the germ cells prior to fertilization and are not due to factors operating for the first time after fertilization has taken place.

Ida Mann, in summarizing the embryological aspects of Treacher Collins Syndrome, places the cause as a retardation of differentiation of maxillary mesoderm at and after the 50 mm. stage. To quote her: "The paraxial mesoderm surrounding the central nervous system extends in the form of enveloping capsules around the sense organs (olfactory, optic and otic) while the visceral mesoderm advances secondarily in the form of the maxillary process of the first visceral arch (mandibular) to produce the supporting skeletal and outer coverings necessitated by the great increase in width of the brain in the higher vertebrates. Thus both phylogenetically and autogenetically we find a steady increase in the size and importance of the maxillary process. It forms in the first place the wedge of tissue which, extending upwards behind the laterally placed eyes to form the temporal bone and muscle, is mechanically responsible for the swinging round of the eyes from the lateral to the forward position required in binocular vision. In the second place it is responsible for the maxilla and malar bones, and thirdly, its superficial extensions account for the lower lid, the vestibule of the nose, and the whole moulding of the side of the face."

As to the time of the delay or arrest in development certain facts point to about the end of the second month. For the position of the eyes to be normal the upgrowth of the visceral wedge must be normal up to the third month. The deafness points to malformation of the middle ear and thus an arrest in development before the end of the second month. An arrest in development at this time is consistent with normal teeth formation since the primary dental lamina begin early in the sixth week while the eyelashes and meibomian glands of the lower eyelids begin to appear at the 50 to 60 mm. stage (about the end of the second month).

The treatment of these cases presents a varied plastic surgical problem. The ear reconstructions will have to be dealt with as individual cases. The more severely deformed ears will be reconstructed about preserved human ear cartilage as we have done for the past two years. The partial reconstruction will probably be carried out using carved preserved rib cartilage as the supporting framework. The eyelid notches should probably be repaired by the Wheeler halving operation or a modification (such as Hughes'). The malar deficiencies are easiest corrected by inserting shaped preserved costal cartilage. However we have satisfactorily used diced and flaked cartilage for this purpose, inserting it with the De Kleine "chondrojet" and moulding it into shape after its insertion. The receding chin is best treated by insertion of a solid preserved cartilage implant, or, if desired, by diced or flaked cartilage.

Needless to say, consultation with the orthodontist, the ophthalmologist, the otologist, and the psychiatrist is very important.

CONCLUSION

A review of the literature has revealed four reported cases of "Treacher Collins Syndrome" in England and none in America. Five cases have been described by the authors and a brief discussion of the embryology and etiological factors has been given. Also, in brief, the recommended plastic surgical treatment has been suggested.

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SKIN GRAFTING

Gordon, Stuart: The Subcutaneous Transplantation of Skin. *Brit. J. Plast. Surg.*, 1: 212, Oct., 1948.

It is pointed out by Gordon that cutis grafts have been used to repair damaged dura, incisional and inguinal hernias, shoulder dislocations, fractures of long bones, partial tendon loss, ligate vessels, fill depressions, anchor a dislocated clavicle, suspend a uterus and repair deformities of the knee, hip and elbow with arthroplasties.

Conclusions reached by earlier authors including Peer and Paddock, Mair, Harkins, Loewe, Cannady and West and Hicks were, in general, that such grafts (1) heal rapidly and well, (2) have great vitality, (3) are able to survive under adverse conditions, (4) develop a good blood supply, (5) gradually assume the function of the part replaced, and (6) are readily available.

The author who was taught that burying skin within the body was a surgical sin soon punished by cyst production, did some experimental work to clarify his own ideas.

Four groups of experiments were performed: (1) A rectangle of lumbo-dorsal fascia was removed on each side of *10 rabbits*. One side was repaired by a dermis graft, the other by a thick split graft. Grafts were sutured under moderate tension. Cysts were formed in three instances where skin was used; in one instance where dermis was

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used (2) Diced dermis was buried in the muscle on one side and diced split skin graft in the muscle of the opposite side of 9 rabbits Four cysts developed where skin was used, two where dermis was used (3) Strips of dermis employed as sutures were used to close the peritoneal cavity or part of the abdominal wall in 12 rabbits Four developed cysts, in the ends only, suggesting that tension might play a part in prevention of their formation Specimens were recovered in each group at intervals of one week to 6 months (4) Dermis was frozen by placing it on dry ice covered with sterile cellophane and then rapidly thawed in hypotonic saline, the process being repeated three times This "treated" dermis was used as a suture in 12 rabbits Specimens were removed in one to 16 weeks, and no cysts were formed

Gordon concludes that the burying of autogenous skin or dermis in the rabbit will result in cyst formation in from one fifth to one third of the instances, that the use of dermis alone reduces the incidence of cyst formation by about one half, and that use of treated dermis may prevent cyst formation

Editorial Comment There appears to be a much greater incidence of cyst formation when dermis or full thickness skin is buried in animals (rabbits and dogs) than when dermis or full thickness skin is buried in the human

Cyst formation in the human arising from epithelial elements in a buried dermal graft is rather rare Indeed free buried transplants of full thickness skin only occasionally result in cyst formation in the human

May, Hans and Spann, R. Gayle: Cutis Grafts for Repair of Incisional and Recurrent Hernia. *Surg Clin North America*, April, 1948, p 517

In the opinion of May and Spann, the cutis graft has definite advantages over the usual fascia lata in the reenforcement of tissue defects in recurrent and incisional hernias These grafts consist of full thickness of skin minus the epidermis The early objection that buried glands would produce cysts, subsequently proved false It has been demonstrated that these structures and also hair follicles degenerate The skin undergoes

metaplasia until it grossly resembles fascia after 3 months, yet all skin elements can be identified microscopically

Cutis grafts are applicable anywhere the use of fascial grafts or sutures is advocated Its advantages are availability and strength in all directions of pull The grafts take better when sutured under tension, and having a higher rate of metabolism and being less inert than fascia, they are more readily vascularized and replaced by live connective tissue

The donor site is meticulously prepared, the epidermis is raised in a sheet 008 to 010 inch thick, cemented to nylon or the dermatome and left hinged at one end The cutis graft is outlined, rolled over gauze as it is stripped from the fat, and the nylon-covered epidermis replaced and sutured Pressure is applied for one week, then the sutures are removed

In inguinal hernia repair, the cutis graft is sutured on the defect of the posterior wall of the inguinal canal One end of the graft is sutured to the periosteum of the pubic tubercle, one edge to Poupart's ligament, the other edge to the fascial covering of the conjoined tendon, leaving a "V" for the spermatic cord The cord is laid back on the graft, and the aponeurosis of the exterior oblique muscle is repaired over the cord and graft Several other variations are described, and cases are reported In incisional hernia the fascia is dissected clean for one inch around the defect, the excess peritoneum is excised followed by closure The fascia is closed as much as possible with cotton and wire, and the cutis graft sutured over the closure and down to the subjacent structures under tension, the remainder of the structures are then closed as usual

The disadvantages are (1) the increase in preparation and operation time, especially in patients who are a poor risk, and (2) the delay in healing of the donor site Some operators have advised the use of whole skin taken from over the hernia, but such skin is usually of poor structure

Swanker, Wilson A : Repair of Fascial Defects with Whole Skin Grafts. *Am J. Surg* , 75 677, May, 1948

In Swanker's opinion, repair of fascial defects has left much to be desired, as pedicle

or free grafts of homogenous fascia sufficient for large defects may create new defects or a weakening of the donor area. Probably the most applicable method in the past was a weaving suture. A substitute tissue for fascia should be readily obtainable, and strong and amenable to transplantation, i.e., it should have a good blood supply to insure take. The skin fulfills these requirements; the stratum corneum and superficial stratum granulosum (16/1000″) are removed for use as a split-thickness graft.

A dermal-fat-fascial graft was used to fill a soft tissue and fascia lata defect so large that two grafts were taken from the abdominal wall and sewn together. Subsequently, a collection of serum was drained and part of the fascial layer removed. The wound then healed, with cure of the muscle hernia. Fixation of the skin to the scar necessitated a second operation, which revealed that the dermal graft had closed solidly. This chance discovery led to further use of dermal grafts for this purpose.

Dermal-fat grafts are preferable for large muscle herniations through fascial defects and were used on the extremities in 17 cases. They were also used for abdominal wall fascial defects in the repair of hernias and fresh defects in 32 cases. Their use in inguinal hernias was especially effective in the direct type, converting them to the indirect type and fortifying the floor of the canal with dermal tissue.

Neumann, C. G., and Conway, H.: Evaluation of Skin Grafting in the Techniques of Radical Mastectomy in Relation to Function of the Arm. *Surgery, 23*: 584, Mar., 1948.

The primary purpose of radical mastectomy is cure of the carcinoma, as pointed out by Neumann and Conway. It is also important that satisfactory function of the arm be maintained. Three hundred and eight patients on whom radical mastectomy was performed with the use of the Halsted technic, at the New York Hospital between September 1, 1932 and December 31, 1946, were found suitable for follow-up in respect to the efficacy of split-thickness skin grafting in the closure and its effect on function. Criteria for function were range of abduction (less than 90° being considered poor, 90–160° good,

more than 160° excellent); the amount of edema (moderate, less than 2 cm.; marked, more than 2 cm.), and the effects of radiation and age.

In those whose wounds were closed with a graft, 23 per cent had poor function, 51 per cent good, and 26 per cent excellent; of those with small grafts (less than 60 sq. cm.), 14.5 per cent were poor, 45 per cent good and 43.5 per cent excellent; those with large grafts (greater than 60 sq. cm.), 27 per cent were poor, 35 per cent good, and 37 per cent excellent. Of 150 patients receiving radiation therapy 24 per cent had poor results; of the remainder not treated thus, 16 per cent had poor results. These results are irrespective of the graft or the size of the graft. The highest incidence of poor results was among those wounds closed without a graft and given radiation therapy. The incidence of edema was not studied in regard to grafting but was found in a higher percentage of those with poor function (marked edema, 35 per cent poor; no edema, 13.5 per cent poor). Poor function was more common in the patients of advanced age and *vice versa*.

The authors hold that closure should be made with the arm at 90° and the skin should be closed without tension, the residual defect on the chest wall being closed with a graft. This allows normally elastic skin to remain in the axilla. The thigh affords a generous donor site, the dermatome being used for removal with the long dimension horizontally. A thick graft is preferable though a thin graft is acceptable because of minimal trauma in this region. The "take" is important. Failure to take plays a part in infection, and resultant edema and contracture of granulations interfere with function. A secondary graft to cover such defects is suggested.

The use of a skin graft in the closure of the wound in radical mastectomy is viewed as an operative step which allows the preservation of full function of the arm in a group of patients with carcinoma in whom the probability of cure is good.

Marsden, C. M.: Whole Skin Graft Repair of Inguinal Hernia; An Account of 163 Operations with Follow-up of 136 Operations at Twelve Months. *Brit. J. Surg., 35*: 390, Apr., 1948.

The cases of inguinal hernia reported by

Marsden were taken from the older age group of men about to be demobilized No patient was refused operation regardless of duration, size or recurrence of the hernia A Gallies fascial type of repair was thought to be in advisable because the thigh operation is often a frequent cause of disability among soldiers The skin graft repair of Mair was used One hundred and sixty three operations for hernia were done (79 for oblique lesions down to the scrotum, 77 for direct and 7 for saddlebag hernia) and of these, 85 were recurrent and 77 were simple The average duration for the simple oblique hernia was 2 years, for the direct, 3½ years, and the recurrent, 6 years The types of previous repairs were listed

Routine skin preparation for laparotomy was carried out In the oblique lesions the sac was excised at the neck, in the saddlebag lesion the epigastric vessels were divided, and the continuous sac removed In the direct lesion the sac was excised in 60 lesions but not in 15 The transversalis fascia was repaired in the direct type by plication and in the indirect by mattress sutures about the cord The graft was anchored proximally and distally, the two limbs of the graft were sutured about the cord in such a way as to leave enough skin graft above the internal ring Double No 60 thread was used The exterior oblique flaps were closed over or under the cord as convenient

Of the 163 operations for inguinal hernia, 136 were followed up at 12 months and 9 8 per cent recurred Of the recurrent hernias 16 6 per cent showed further recurrence In the 15 direct hernias in which the sac was not removed, 9 recurred (60 per cent)

In conclusion, Marsden states that trivial infections that occurred were not due to the graft Inclusion cysts were not reported The recurrence rate is high but not when the type of hernia repaired is considered, it is similar to that of a Gallie repair The indications for skin graft repair are similar to those for a fascia repair

EYE

Sherman, Arthur E.: Choice of Procedure in Ophthalmic Plastic Surgery. *New York State J Med* , 48 861, Apr 15, 1948

Sherman's opinions are based on his own experience and that of a number of other ophthalmic and plastic surgeons who served

in the Army Medical Corps during and following World War II

The basic principles and procedures developed and emphasized by the late Dr John W Wheeler still form the basis of present day ophthalmic plastic surgery

In general, plastic surgery should be postponed at least 3 months after the initial repair Scar tissue should be as thoroughly excised as possible and tissue approximated without undue tension Whenever possible eyelid structures should replace eyelid structures Procedures should be as simple as possible to attain the desired result Application of good, evenly distributed pressure dressing is very important

At times simple excision of scars or tumors in the eyelid region with careful closure of normal tissues is all that is necessary The addition of a lid adhesion may be indicated to support the lower eyelid Wheeler's "halving" method of closure is unsurpassed when a vertical excision extends through the lid margin

The repair of a displacement of either canthal area entails free mobilization of the area, excision of scar tissue, firm anchorage of the canthal ligament, and distribution of tension so that there is little tension on the ligament itself At times it is helpful to interpose a flap of skin from the upper lid to the area below the canthus

For the correction of cicatricial ectropion or lagophthalmos, no other method equals that perfected by Wheeler This briefly consists of thorough release of the lid by excision of all scar tissue, free skin graft of the upper eyelid or post auricular skin, and lid adhesions for about 3 months The Esser "inlay" or Gillie's "outlay" type of graft should be avoided

Subtotal or total full thickness loss of an eyelid is best reconstructed by Hughes' method, in which the remains of the lid is joined to the opposing lid and a portion of the tarsus is used in the newly constructed lid Pedicle flaps from the forehead or cheek area should be avoided A free skin graft from the other upper eyelid may be needed to supply sufficient skin Eyelash grafts are best taken from the centre of the nasal half of the eyebrow

Eyebrow deformities can often be corrected by Z plasty or interposition of flaps

Loss of an eyebrow is best replaced by free grafts, 7 mm. wide, taken vertically from the occipital scalp.

Small depression deformities of the orbital margin can be satisfactorily filled with fascia lata. Larger defects are best repaired by means of a cancellous bone graft from the ilium. This was found to be superior to the use of cartilage or inorganic material.

The correction of external deformities should be completed before socket deformities are corrected. Partial contraction of the socket can be well corrected by free grafts of buccal mucous membrane. Extensive contracture of the socket is best corrected by Wheeler's entire reconstruction with a thin Thiersch (epidermal) graft. In both these procedures all scar tissue should be removed and the socket enlarged to the periosteum except in the region of the levator.

Retracted sunken sockets should have a late implant behind Tenon's capsule (Wheeler's grooved glass sphere) and, if indicated, an implant to the floor of the orbit to eliminate the retraction of the tissues below the brow. The implant to the floor of the orbit should be under the periorbita and can be of cartilage, wedge-shaped acrylic resin, or glass wool. This implant is also indicated to elevate a depressed enophthalmic eye following depression fracture of the floor of the orbit.

In extensive loss of the eye and eyelid tissues it is usually better judgment to provide a smooth skin covering for the area rather than attempt a prolonged reconstruction which will result in disappointment.

Photographs illustrating a number of the above procedures in 13 cases are included in the article.

Callahan, Alston: Reconstruction of the Canthi. *Tr. Am. Acad. Ophth. & Otolaryng.*, May–June, 1948, p. 486.

This report is based on experiences with 37 patients having canthal deformities. Callahan first reviews the anatomy of the tarsi and canthal ligaments. He stresses the importance of firmly anchoring the ligament to its original attachment. In his first cases he followed Wheeler's technic of attaching the ligament to the periosteum with silk mattress sutures after sufficient dissection and excision of scar tissue to mobilize the area well. He later preferred to anchor the liga-

ment with stainless steel wire through small holes drilled in the bone. Very satisfactory results were obtained in the 5 cases illustrating this method. In one case in which the eye was still present, the deformity of the medial canthus was well corrected, stainless steel wire anchorage being used, and the function of the tear sac was preserved by means of a dacryocystorhinostomy.

Editorial Comment: It would seem that this technic of anchoring the medial canthal ligament with wire is of value in those patients who having a loss of bone and periosteum in the area had no good anchorage in periosteum. It would be very seldom that the external canthal ligament cannot be satisfactorily anchored to periosteum.

Fox, Sidney A.: Some Methods of Lid Repair and Reconstruction; Displacement of the Canthi. *Am. J. Ophth.*, *31:* 317, Mar., 1948.

Three cases of upward or downward traumatic displacement of the canthal area are reported by Fox. The plastic repair was performed by using a Z-shaped incision so that the flap containing the canthal area was interposed with a flap of eyelid skin. The author stresses the importance of excising scar tissue and firmly anchoring the ligament in proper position.

Greear, James N.: Use of Buccal Mucosa in Restoration of the Orbital Socket. *Am. J. Ophth.*, *31:* 445, Apr., 1948.

Greear states that contracted sockets are best restored by mucous membrane grafts. Even in a totally contracted socket he prefers this to the use of epidermic skin grafts. Sufficient mucous membrane can be obtained from the mouth to reconstruct a whole socket. He describes his method in which the dissection of the scar tissue and enlarging the socket follow Wheeler's technic. However, the author prefers to use vaseline gauze packing to hold the graft firmly on its bed rather than a stent. He also uses mattress sutures through pieces of rubber tubing to hold the upper or lower fornix in position near the periosteum. There are 5 case reports; all of the patients had satisfactory socket restoration with the described method.

NOSE AND MOUTH

Fomen, S , Gilbert, J. G , Silver, A. G., and Syracuse, V. R.: Plastic Repair of the Obstructing Nasal Septum. *Arch Otolaryng*, 47 7, Jan , 1948

Fomon and his associates restate their concept of the structural anatomy of the septum and its plastic repair. They deny that the septum furnishes support to the nasal pyramid "under static conditions" and hold that it merely acts as a "reserve safety factor " From this they conclude that "saddling of the dorsum and distortion of the nasal tip" as a consequence of a too generous submucous resection result only from tensions developing from the cicatricial pull of the deskeletonized septal membranes, and not from a lack of support Therefore, any part of the septum may be removed without fear of subsequent deformity, provided precautions are taken to neutralize these traction forces For such neutralization, they implant "two or more battens, one in the columella and the other or others above between the freed septal membranes The deskeletonized membranous septum lying between the battens becomes a zone of dispersion for the contracting forces " In other words, after creating a space by wide excision of the septal cartilage, they then partially fill it by the insertion of "battens" in septum, dorsum or columella

Editorial Comment To any one experienced in rhinoplastic surgery, there seems little rationale for this wide excision of septal cartilage followed by the insertion of cartilaginous "battens " It is a fundamental principle of orthopedic and general plastic surgery that straightening and resetting of any displaced part should first be essay ed by manipulating and shifting the structures involved Only when this is impossible, as in extensive losses of tissue, should the use of free grafting material be considered It is contrary to general experience to state, as do Fomon and his colleagues, that the deflected and dislocated septum cannot be corrected adequately by the removal of circumscribed segments and proper mobilization anteriorly and along the floor of the nose If these time honored methods are employed, the introduction of free grafting material, with its attendant risks, becomes unnecessary

Shaw, M. H , and Fell, S. R.: Columella Reconstruction; A Case of Nasal Deformity Resulting from Syphilis *Brit J Plast Surg* , 1: 111, July, 1948

As pointed out by Shaw and Fell, the characteristic crumpled and shortened retroussé nose associated with syphilis is due primarily to destruction of the nasal lining and support, followed by shrinkage of the scar Repair requires excision of the scarred lining, its replacement by a free skin graft, and support by bone or cartilage In the case presented by the authors, reconstruction necessitated the following stages (1) postnasal epithelial inlay to replace lining and restore a skin cover to the evaginated position, (2) reconstruction of the columella from the hand, (3) closure of an oronasal fistula, and (4) a bony graft from the iliac crest to support the nose

Richardson, George S. and Pullen, E. M : The Uvula. *Arch Otolaryng* , 47 379, Apr , 1948

Richardson and Pullen deal with the structure, function and importance of the uvula, they describe the related anatomy concisely, including the relevant anatomy and histology of the nose, soft palate, and uvula, with the physiological considerations involved

Observations of the directional air streams in the nose and mouth were made by studying the passage of smoke through these passages The normal palate, uvula, anterior and posterior pillars have considerable importance in protecting the orifices of the eustachian tubes from drying in the normal breathing process

In deglutition, the palatopharyngeal arches move upward and close the nasopharynx from the oropharynx The uvula moves with this, but acts only as a central reenforcement

The uvula acts as a drain for mucous secretions from the nasal cavities toward the base of the tongue Tenacious secretion may be transferred from the midline to the posterior pharyngeal wall As the tongue is lowered, the uvula helps to transfer the secretion to the tongue for expectoration

Cases are presented exhibiting the effects of damage to or removal of the uvula

In a summary by the authors, the following functions are attributed to the uvula. (1) massage and moistening of the posterior

pharyngeal wall; (2) aiding in removal of material from the posterior pharyngeal wall and passing it to the base of the tongue; (3) acting as a bridge between the velum and the posterior pharynx as secretion moves from the midline posteriorly; (4) aiding to prevent middle ear disease in children; (5) preventing pharyngitis sicca and drying of the eustachian orifices; and (6) being a valuable adjunct to voice control, possibly as a midline buttress, particularly in singers. This is of little value in speaking. (7) A deviating uvula may indicate a weakness of the accessory nerve on the opposite side.

HAND

May, Hans: **Repair of Cicatricial and Dupuytren's Contractures of the Hand.** *Plast. & Reconstruct. Surg., 3:* 439, July, 1948.

May discusses the mechanism of cicatricial contractures of the hand which follow injuries, infections and burns. Prevention of such deformities is aided by immobilizing the hands in a position of function (cocked-up position of the wrist, mid-flexion of the metacarpophalangeal and interphalangeal joints and abduction and opposition of the thumb). Conservative methods in the form of elastic splinting and elastic traction associated with physical therapy and occupational therapy may overcome some contractures. Cicatricial contractures from burns often require operative reconstruction. Second degree burns of the dorsum of the hand are frequently followed by contractures due to keloid-like scars. The difficulty in repair mounts with the depth of the scar.

The principle in correcting these contractures consists of excision of the cicatricial surface, repair of contracted fascial structures and closure of the defect with a graft or flap. The operation is done under general anesthesia, with a tourniquet applied to the arm. After excision of all scar, the tourniquet is released until hemostasis is completed. The tourniquet is then reapplied and remains until pressure dressings have been applied. If the collateral ligaments of the metacarpophalangeal joints are contracted and fix the joints in hypertension, they are severed from their insertion at the heads of the metacarpals. A metal splint is shaped to immobilize the hand and fingers in

the position of function. Next, the defect is covered with either a full-thickness or a thick split graft. If tendons are exposed or must be replaced, a pedicle flap is used instead of a free graft. If a graft is used, it is sutured in place and a heavy pressure dressing is applied. Sutures are removed 8 days after operation. The splint remains for 6 days longer, then warm saline baths with active and passive motion are instituted daily. The splint is reapplied after exercise. Three weeks after operation, the splint is discarded and a motion exercise program is outlined for the patient.

Dupuytren's contracture of the palmar aponeurosis, as stated by May, is a disease of unknown etiology, which progresses gradually, involving palmar aponeurosis, the fourth and fifth fingers and rarely the other fingers. Insufficient removal of diseased structures invites recurrence, the skin often being involved. An operation is performed, with the tourniquet applied. The incision starts over the origin of the palmar fascia, proceeds along the main longitudinal palmar crease, across the transverse creases at the radial side of the palm and ends at the radial side of the base of the index finger. The diseased part of the skin is circumscribed by another incision, and a transverse incision is added to the ulnar side. The skin and subcutaneous scars of the thenar and hypothenar region are dissected from the palmar fascia. The same is done with the healthy skin of the radial and distal part of the palm. The diseased skin remains connected to the fascia. The fascia is now severed from its tendon, and the entire fascia is excised including extensions over the thenar region, the second, third, fourth and fifth fingers. The dissection is tedious and must be done with care. Next the blood pressure cuff is deflated and hemostasis obtained. The forearm, hand and fingers are immobilized in a proper splint. The three skin flaps are returned to their beds. The remaining defect is covered with a thick split graft, and a pressure dressing is applied. Postoperative care is as described above.

Pratt, Gerald: **Tendon Repair with Steel Wire.** *Am. J. Surg., 76:* 87, July, 1948.

Pratt recommends the use of fine steel wire (No. 36 or 35) for primary tendon repair.

Suturing is done after the method of Cervell, minute needles being used and kinking of the wire being avoided The wire suture sinks into the tendon substance, and no suture is visible on the surface after completion of the procedure

The steel wire does not cause tissue reaction and permits healing without serum collection The peritendinous reaction with scars and adhesions is minimized

Kinking of the wire must be avoided Tying is done by hand Knots are tied three times and cut off short

HYPOSPADIAS

Loughran, A M : Observations on Hypospadias Brit J Plastic Surg, I 147, Oct , 1948

Loughran theorizes on the basis of previously reported experimental work that the cause of hypospadias in the human is likely to be some discord in the endocrine symphony of mother and child, quantitative or qualitative

The condition must be differentiated from (a) adrenal virilism in the female child and (b) a congenitally short anterior urethra

Fifty nine patients with hypospadias were treated at the Children's Hospital, Edinburgh, between 1926 and 1942, and 43 could be followed up In 36 of these the Ombrédanne procedure was carried out, but in 7 of these the second stage was not performed The 29 completed cases comprise 9 penoglandular, 16 penile, and 4 scrotal types

A good cosmetic and functional result was recorded in 24 cases, a fair result in 4, and there was only one failure

Early relief of peno-scrotal webbing (the average age at the time of operation being 5 years) allows unrestricted growth to occur

A total of 75 operations were performed on the 29 patients

The author concludes that the Ombrédanne operation is the operation of choice because (a) the late results are good, (b) it is simple to perform, (c) no special instruments are required, (d) deflection of the urinary stream is unnecessary, (e) the penoscrotal web, if present, is incidentally destroyed in using the pouch

Preliminary straightening should be carried out at the age of 2 years, and the Ombrédanne

operation should be performed at the age of three, and the second stage 3 months later

It would appear that too much has been made of urethral hairs as a complication of the Ombrédanne operation

Young, Forrest and Benjamin, John. Repair of Hypospadias with Free Inlay Skin Graft Surg Gynec Obst , 86 439, Apr , 1948

Repair of hypospadias at an early age in order to avoid psychic trauma is recommended by Young and Benjamin The more commonly used methods of repair are mentioned and described briefly Of these the method of Nove Jasserand was selected for use in children because it had the advantage of a minimum number of steps

The chordee is corrected when the patient is one year old by dissecting out the fibrous band responsible for the chordee The ventral incision is closed in multiple triangular flaps in order to avoid contracture The hypospadic meatus is freed together with a short section of the urethra, and the opening is brought out a short distance lateral to the median line The next step is carried out at 2 to 3 years of age (at a minimum period of 6 months after the first step) Perineal urethrostomy is performed, and a Foley catheter inserted in order to divert the urine A tunnel beneath the skin of the ventral surface of the penis is made with scissors, extending from the dimple in the glans to the site of the hypospadic meatus (The hypospadic meatus is freed from its location laterally to the middle line and is brought back to its normal location) A 0 02 inch skin graft is anchored to the catheter, size 14 to 18 French, depending on the size of the penis This catheter is inserted into the above described tunnel and carried into the urethra The posterior margin of the graft is sutured to the hypospadic urethral orifice The glans and the graft wrapped catheter are anchored to the abdominal skin and a pressure dressing applied The catheter is removed from the urethra in 7 days, and the Foley catheter is removed from the perineal urethrostomy a day or two later

The results in 10 cases are described in detail Dilatations were found not to be necessary A child who was operated upon at the age of 3 years has been followed up for 5

years, and there has been no evidence that the graft may have failed to grow, thus reproducing the chordee. Endoscopic microscopic examinations reveal that the graft resembles the mucosa; and no hairs have been observed in the graft.

MISCELLANIES

Pickerill, H. P.: Plastic Surgery in the Treatment of Malignancy. *Brit. J. Plast. Surg., 1:* 181, Oct., 1948.

As stated by Pickerill, thirty years have elapsed since plastic surgery was revived on sound surgical principles at Sidcup. The author has watched in vain during this period for evidence of plastic surgery taking its rightful place in cooperation with general surgery for the bolder treatment of malignancy. If the general surgeon will depend upon the plastic surgeon for reconstruction of a defect, he will be bolder and more successful in his excisions.

Malignant parotid tumors are used as an example of a commonly neglected lesion not adequately removed because of fear of disfigurement.

Recurrences in the skin after the removal of malignant breasts are another example used by the author to emphasize the necessity of adequate excision and plastic correction of the defect. "There are, of course, many other forms of malignancy in which it would be of advantage for the plastic surgeon to work in conjunction with the general surgeon, each becoming bolder in action as each gained experience and confidence."

Editorial Comment: This is an article that should be read by all plastic and general surgeons.

Kantner, Claude E.: Diagnosis and Prognosis in Cleft Palate Speech. *J. Speech Disorders, 13:* 211, Sept., 1948.

Kantner discusses problems of examination, diagnosis, and treatment of speech defects in cleft palate cases.

"Nasality" is the most common component of cleft palate speech. This is primarily a matter of resonance, not directly related to air escape through the nose, or to the degree of opening of the soft palate during speech. However, the amount of nasality increases and decreases with the size of the opening in the nasopharynx. We cannot measure the nasality by detectors, or estimate the p[...] ress by their use.

In examination there are three gen[...] steps: observation of speech patterns, exa[...] nation of speech organs, and consideratio[...] the case history.

Nasality can often be eliminated by pro[...] motivation, sensitization, and traini[...] Much nasality is not based on organic insu[...] ciency. The articulatory pattern itself n[...] be caused by factors other than those rela[...] directly to the cleft palate, as a direct res[...] of the palate condition, and by physi[...] anomaly.

On physical examination, one begins w[...] the lips, then observes the condition of [...] jaws, teeth, hard and soft palate. The l[...] are primarily of cosmetic significance. [...] notes the relation of the upper and lo[...] jaws as to protrusion or retraction, marl[...] open bite, and wide irregularities of [...] upper central teeth. Each physical irreg[...] larity has only a relative significance to [...] speech pattern.

In Kantner's opinion, with good inte[...] gence, good motivation, an agile tongue, ke[...] hearing, and proper training, most patie[...] with cleft palate acquire fair speech rega[...] less of the condition of the teeth and jaw[...]

Minor defects of the hard palate are [...] little importance except in preventing t[...] passage of food into the nose. The soft p[...] ate is the most vital and difficult part [...] physical diagnosis. The important consi[...] eration is whether the patient makes clos[...] of the nasopharynx *during speech*. If he p[...] duces single words, vowels or syllables, no[...] nasally with relative ease, he may be able [...] attain good speech training.

In closing the nasopharynx, the last pa[...] of the maneuver to closure is most importa[...] The patient must have additional moveme[...] enough to bring him within striking distan[...] of complete closure. Palatal exercises are [...] waste of time if the palate is inadequat[...] tense and scarred.

The importance of tonsils and adenoids i[...] matter of dispute. Apparently adenoids a[...] of more significance than tonsils. In certa[...] cases, following the removal of adenoic[...] there was a marked increase in nasali[...] which could not be overcome.

The case history involves evaluation [...]

factors such as the number of operations, family background, attitudes *et cetera*.

Many children now being born with cleft palate will achieve good or normal speech without need for training. This is due to better operative techoics, facilities for early and proper repair, and so forth. Most of the severe speech defects are found in adults and older children.

The goal should be that every patient with a cleft palate should have the best possible training commensurate with his needs, physical limitations, mental ability, and potential contribution to society.

Zimbrón, A. Velazco: Surgical Treatment of Prognathism. *Vida Nueva*, Agosto 14, 1947.

Zimbrón describes a technic which, in his hands, has proven useful in dealing with prognathism. The surgical steps are:

(a) Regional anesthesia.

(b) Incision, ½ inch from the vertex of the mastoid process to the border of the ascending ramus of the mandible.

(c) Blunt dissection, the parotid gland and facial nerve being protected. The periosteum on both sides of the bone is separated.

(d) Osteotomy of the ascending ramus in the transverse position with a specially devised osteotome.

(e) Once the section of the bone has been performed on both sides, the mandible is held in retrusion with previously cemented dental splints.

(f) Suture of the incision.

The bone section should be made on the occlusal plane, control should be obtained by a nonsterile assistant working within the mouth. Mobilization should be started in 3 to 4 weeks.

STUDIES ON THE PATHOLOGIC ANATOMY OF THE UNILATERAL HARE LIP NOSE*

WM C HUFFMAN, M D , F A C S , and DEAN M LIERLE, M D , F A C S

The occurrence of the cleft lip anomaly in about one-tenth per cent of all births would lead one to believe that an occasional cadaver with this deformity would be obtainable for dissection However, few teachers of anatomy can recall having seen such a specimen in their laboratories Because of the rare appearance of these in the dissecting room, one is forced to learn what he can concerning their faulty anatomy from the study of living patients, photographs, masks, and operative experience The material that we present has been gleaned in such a manner

In a search of the literature for information concerning the nasal variations that may accompany a unilateral chiloschisis, we were unable to find what we considered a comprehensive and detailed study of the condition For our own clinical information, we found it necessary to prepare as complete an analysis as possible While doing this, we gained the impression that the malformation of the nose was not due so much to inherent aberrations of the size and shape of the elements of the nasal skeleton (cartilaginous and bony) as it was to their being held in faulty positions It is very possible that the conclusions we have reached are entirely erroneous If so, this paper will have well served its purpose if it stimulates some more accomplished anatomist to direct his attention to this problem

As the technique of primary repair of the cleft lip has improved in the hands of Blair, Brown, Ivy, Axhausen and others, so has the accompanying nasal deformity received more and more consideration until today, the nose and lip receive properly proportionate care at the time of the initial operation The fortunate result of the trend away from focusing attention almost exclusively on the lip has been the decreasing frequency with which extreme postoperative nasal deformities are encountered Even so, there is still a large enough number of persons who present themselves because of marked nasal disfigurements to make the study of such defects of prime importance

Parenthetically, it might be stated that in the course of our investigations we continually confused ourselves and our staff when discussing various parts of the nose When the patient was on the operating table the tip of the nose was "on top", when he was sitting erect the tip was "in front", and so ad infinitum In order to avoid misunderstandings we were forced, even when talking among ourselves, to use the anatomical terms cephalad, caudad, dorsal, and ventral and will apply them in all further discussion

After some bitter experience, we have reached the conclusion that the internal and external nasal anatomy must always be considered as an entity So strongly do we feel on this subject that we routinely determine what is to be done with

the nasal septum before we even consider how to approach the correction of the external nose. Even as we realized that it was folly to try to "build a straight nose on a crooked septum" we were surprised to find how often the nasal septum was not at all in the alignment that one would expect to find it from external examination. In some cases, the nose was deflected to one side or the other and the ventro-caudad (antero-inferior) portion of the septal cartilage was found resting in the columella and deflected to a corresponding degree; in others, the septum was found dislocated from the columella and, at first glance, seemed to be excessively deviated, but on more considered examination proved to be the only part of the nose that fell in the midsagittal plane; in still other cases the septum was curved to the side opposite that to which the external nose was displaced. When the septum is found in or very near the midsagittal plane the reconstruction of the external nose will be simplified since it presents a midline skeletal structure to which the mobilized external nose may be fixed. If the septum lies to one side or the other of the midline to any degree its replacement in a normal position is obligatory before the external nasal deformity is attacked.

Full appreciation of the misproportions of the external nose can be gained only by careful palpation and examination from full face, profile, and basal views. From these the defects present may be classified as being in the caudal one-third (lobule) the middle one-third (upper cartilaginous vault) or the cephalad one-third (bony vault) of the nose.

The greatest variety of asymmetries was found in the lobule. It would be natural to expect the lower lateral cartilage that makes up the half of the lobule lying on the same side as the cleft in the lip to be in a more faulty position than its fellow of the opposite side.

In Figure 1 most of the points of abnormality that can be seen from a basal view of the nose are illustrated. Since we were unable to find any one nose in which all possible types of faulty anatomy were present the drawings used here and elsewhere are composite ones, and photographs of many different patients are required to show all points discussed. In addition several aberrations were noted on examination of patients that could not be made apparent in their photographs. Nevertheless, actual photographs are used as much as possible to illustrate each defect.

The photographs used in Series #1 depict the faults that we believe can be classified as common or "typical" when the nose is examined from a basal view. Each picture is used to show one specific distortion but in each one can be found other deformities occuring in any number and combination.

In "A" the tip of the nose is seen to be deflected away from the side of the cleft in the lip or toward the uninvolved side of the lip. In B the nasal tip (dome of the lower lateral cartilage) on the involved side is dorsally displaced (retroplaced). C shows the angle between the medial and lateral crura of the lower lateral cartilage on the involved side to be excessively obtuse, causing a "blunting" of the ventral (anterior) extremity of the naris. Illustrated in D is a defect that is almost constantly present: the involved ala presents an inward "buckling" rather than a gradual outward curve while E brings out a fault that is almost as

common, absence of the alar-facial groove and attachment of the ala to the face at an obtuse angle. A real or apparent deficient bony development underlying the alar-facial attachment on the involved side is shown in E and F. The next three photographs are used to show typical ill-proportion of the naris; in G its
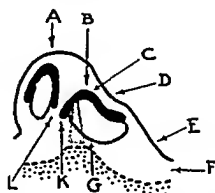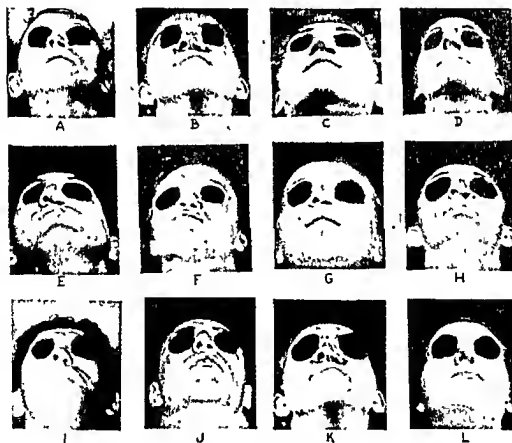

FIG. 1. CORRELATE WITH CORRESPONDING PHOTOS IN PHOTOGRAPHIC SERIES NO. 1

PHOTOGRAPHIC SERIES NO. 1

dorsal (posterior) extremity is overly wide, in H its circumference is greater than that of its fellow, and in I the entire naris is in a more dorsal position (retro-placed) than the one on the uninvolved side. The final three pictures in the series call attention to variations in the size, shape, and direction of the columella; examination of J reveals that the columella is shorter in a ventro-dorsal (antero-

posterior) direction on the involved side than on the uninvolved side, in K the medial crus of the lower lateral cartilage that lies in the half of the columella on the involved side is dorsally displaced (retroplaced) in relation to its opposite member, and in L the columella takes an oblique direction with its dorsal (posterior) end slanted toward the uninvolved side of the nose and lip.
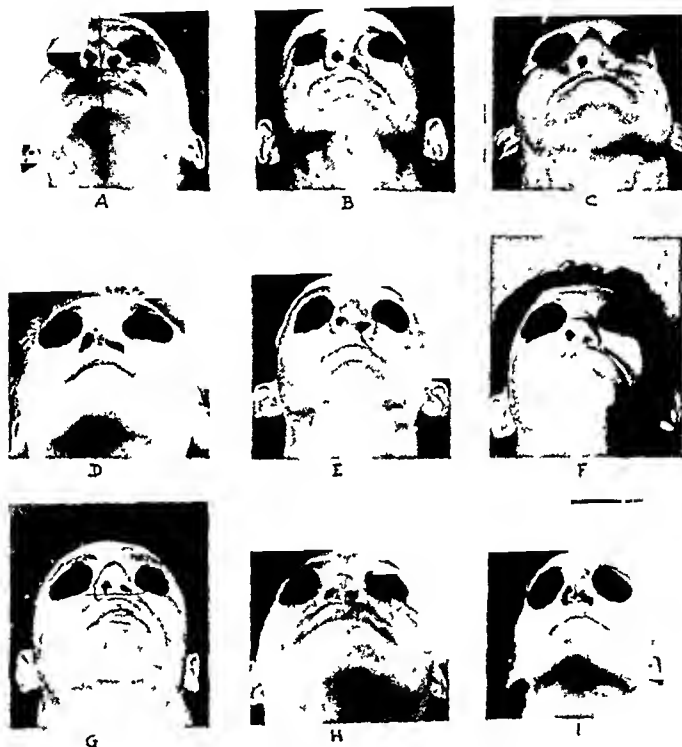
PHOTOGRAPHIC SERIES No 2

If the photographs used to illustrate specific "typical" distortions in Series #1 are re-arranged and a few more added as has been done in Photographic Series #2, it becomes evident that some of the "typical" abnormalities are absent or exactly reversed.

A cursory comparison of A in Series #1 with A in Series #2 leaves the impression that the lack of nasal symmetry is due to the same cause in each case, but more studied analysis shows that in A of Series #1 there is an actual lateralward displacement of the nasal tip while in A of Series #2 the deviation is only apparent. Here the seeming deflection is due to a lack of prominence of the dome of the lower lateral cartilage on the involved side (fig. 2) and experience teaches that in such instances the septum is very apt to lie in the midsagittal plane while

in true tip deviations the septum is likely to curve in the same direction   Instead
of the commonly present "blunting" of the ventral (anterior) extremity of the
naris seen in C of Series #1 the angle between the medial and lateral crura of the
lower lateral cartilage may be extremely acute and cause unnatural "sharpening"
of the naris as illustrated in B of Series #2   In contrast to C of Series #1, C of
Series #2, represents an exact reversal of a "typical" deformity, the ala is
attached to the face at a more acute angle than it should be and excessive depth
of the alar-facial angle is the result   Rather frequently there is adequate bony
development underlying the involved alar facial angle (Series #2D as con
trasted with Series #1E and F), when the growth and projection of bone in this
part of the maxilla is normal or nearly so the nasal reconstruction is obviously
simplified   The broad dorsal (posterior) extremity of the naris of #1G may be
replaced by one forming an acute angle as in #2E, and a naris of less than normal
circumference is sometimes seen (#2F) instead of one of too great a perimeter
while the dorsally displaced (retroplaced) naris of #1I may not be evident

APPARENT DEFLECTION
OF NASAL TIP

A

APPARENT DEFLECTION
OF NASAL TIP WITH
TWISTING

B

ACTUAL DEFLECTION
OF NASAL TIP

C
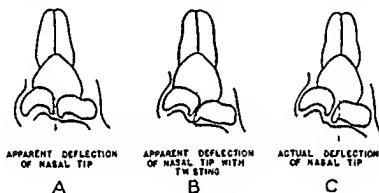
Fig 2

(#2G)   The columella may be of equal or nearly equal length on both the
involved and uninvolved sides (#2H as compared with #1J), the leaf of its
involved side may not be dorsally displaced when judged by the position of the
dorsal end of the medial crus of the lower lateral cartilage (#2I in contradistinc
tion to #1K), and the columella may fail to assume an oblique direction (#2D as
opposed to #1L)

It is notable that even when some of the "typical" abnormalities are absent or
reversed two of them, the dorsal displacement of the dome of the involved lower
lateral cartilage and the inward buckling of the ala on the deformed side, are
practically always present

Inspection of the nasal lobule from a direct full face aspect leaves an immedi
ate impression that the tip does not lie in the midline   Here, as in the basal
view, it may be that there is only apparent deviation of the tip due to lack of
prominence of the dome of the involved lower lateral cartilage (fig 2A)

Actual or apparent tip deviation may be determined by constructing a midline
perpendicular on a full face photograph, by observing the involved side of the
nose, or by printing a composite double print photograph with the uninvolved

side of the nose and face reversed and substituted for the involved side (A, A′ and A″ of Photographic Series #3).

In a second type of apparent tip deflection the illusion of lateralward displacement is made even stronger by what might be termed a "twisting" of the lobule.   In such cases the lower lateral cartilages lie in a position that would be assumed if they were rotated around an axis between and parallel to their medial crura.   Figure 2B attempts to show graphically the relations assumed by the lower lateral cartilages under this condition, and B and B′ of Photographic Series #3 depict the actual appearance.   When this "twisting" is accompanied by a true displacement of the tip from the midline as shown in figure 2C, we have

PHOTOGRAPHIC SERIES No. 3

found the deviation to be almost constantly toward the uninvolved side, the analysis of which is brought out in C and C′ of Series #3.   Photograph D of the same series is introduced to emphasize the point that a variation is sometimes the reverse of the expected "typical"; here the tip deflection is in the opposite direction, toward the involved side of the lip and nose.

The entire tip of a unilateral hare-lip nose is often dependent, but more worthy of attention is the fact that the half of the nasal tip formed by the lower lateral cartilage on the side of the deformity is so much more dependent than the opposite half (fig. 3).   It may also be noted that the caudad (downward) and medial rotation of the lateral crus of the lower lateral cartilage on the involved side causes the two nares to exhibit an extreme difference in appearance.   The free rim of the involved ala lacks a normal gradual cephalad (upward) and dorsal (backward) curve so that the naris is almost or entirely hidden from view.   The degree of this defect differs greatly from patient to patient and would be expected

to vary more with the point of alar-facial attachment than it actually does The ala may be attached to the face at a level that is cephalad to its fellow (too high) as shown in figure 4A or caudad to its opposite member (too low) as in figure 4B
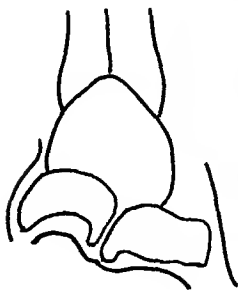

Fig 3

A

B

Fig 4

but in either case the naris is wholly or partially obscured by the alar rim Figure 4B also brings out another fairly common defect, when the ventral (anterior) portions of the lower lateral cartilages are widely separated there results a tip that is cleft and of excessive width

In reference to the just mentioned "too high" or "too low" alar-facial attach-

ment on the involved side it has been our experience to find the involved ala attached to the face at a more caudal level ("too low") than its fellow in the vast majority of cases. We hesitate to make any dogmatic statements as to whether this improper point of attachment is due to faulty primary surgery or to post-operative scarring and/or unequal growth, but our suspicions are in favor of the former.

If one accepts the theory that the greater part of the deformity of the lobule is due to an axial rotation of the lower lateral cartilages, especially of the one on the involved side, he would expect the medial crus of the cartilage on that side to lie at a more caudad (lower) level in the columella than its fellow as shown in figure 5A. Such proves to be the situation in most instances. That this defect is seldom well marked in photographs can be seen by examing figure 5B but it becomes evident upon palpation of the columella and examination of the patient with light directed from several different angles. The rotation theory again

A   B   C
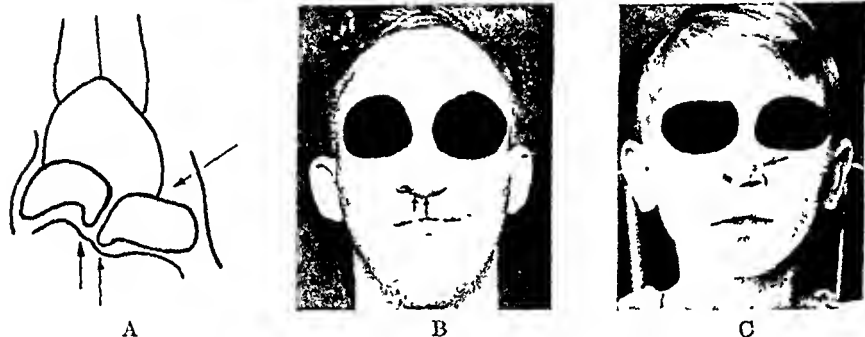
Fig. 5

seems tenable when the "caving in" of the side of the nose at the caudad (lower) part of the upper lateral cartilage is noted (fig. 5C). We attribute this defect to the caudal (downward) displacement of the cephalad (upper) edge of the lower lateral cartilage with resultant deficient support of the soft tissues rather than to a deformity of the upper lateral cartilage itself.

Lateral deviation of the part of the nasal skeleton made up of the upper lateral cartilages and nasal bones may or may not be present; if present it is nearly always toward the uninvolved side. When there is deflection of the cartilaginous part of the external nasal skeleton with little or no displacement of the nasal bones we have found that the deformity frequently is accompanied by a corresponding bending of the cartilaginous part of the nasal septum. If such is the case, the external nasal deformity may be corrected or lessened in many instances by reconstructing the septum and placing it in the midsagittal plane. Of course, this procedure will do nothing toward correcting deviation of the nasal bones.

Some of the abnormalities seen on a profile examination are repetitions of those already described but others are apparent only from this view.

Dorsal displacement (retroplacement) of one or both lower lateral cartilages
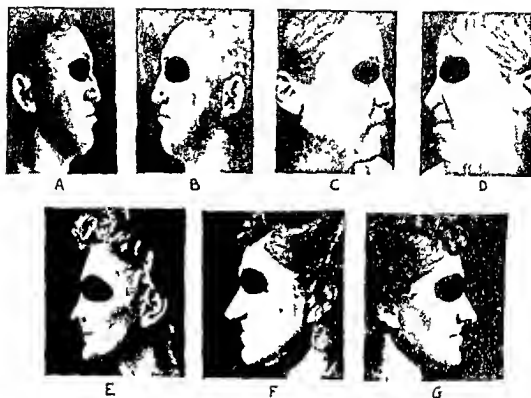
FIG 6

along with caudal (downward) rotation of the angles of one or both of them causes a recession and dependence of the nasal tip Such dorsal displacement may be so extreme that it is obvious on profile views of both the involved and uninvolved

sides and also seems to cause displacement of the caudal ends of the upper lateral cartilages (Photographic Series 4A and B).   In other instances only the lower lateral cartilage on the involved side seems to be displaced so that the deformity is visible only on the profile examination of that side (Series 4C and D).

Upon viewing the normal nose in profile the free rim of the ala forms a gradually arching curve so that nearly the entire length of the columella is visible (Series 4E).   In the hare-lip nose the displacement of the lower lateral cartilage on the involved side causes the lateral crus to lie at a more caudal (lower) level so that the columella may be hidden entirely (Series 4F).   Invisibility of the columella cannot always be blamed entirely on the sagging of the involved lateral crus because at times the columella itself is retracted into the nose; this retraction can be seen from the uninvolved side and may include the entire length of the columella but is nearly always more apparent at its junction with the lip (Series 4G).   When the medial crura of the lower lateral cartilages lie in such a retracted position the septo-labial angle is more acute than normal.   This acute angle lends an illusion of excessive nasal length and retraction of the whole columella causes the nose to appear "chopped off".

Even though there is no reason why a hare-lip nose might not present an actual bony hump careful analysis will show that in many instances the hump is not an actual increase in profile projection but is apparent only as a result of dorsal (backward) displacement of the cartilaginous portion of the external nasal skeleton.   The apparent bony hump seen in figure 6A has been minimized by advancing the profile projection of the upper and lower lateral cartilages with the result shown in figure 6B.

A discussion of the revision of a previously repaired hare-lip is not within the scope of this study, but we feel it worth remarking that nasal deformities frequently co-exist with a lip requiring secondary repair.   In such cases we are convinced that the best results are obtained by reconstruction of the nose and lip at the same operation.

We have followed the theory that most of the nasal deformities present in a unilateral hare-lip nose are due to a rotation of one or both lower lateral cartilages rather than to inherent aberrations in their sizes and shapes to devise a basic procedure aimed toward placing them in their normal positions.   We have used this fairly simple maneuver on enough occasions to find that it solves many of the problems arising in the nasal reconstruction.   When and if we operate upon a large enough series of cases to prove its worth we shall attempt to describe the procedure in minute detail.

FRACTURE OF THE ZYGOMATIC TRIPOD

Easily Reduced by Intranasal Manipulation

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Many fractures of the face can be reduced conveniently as an office or as a clinic procedure   In my experience, the operating time and the morbidity are reduced to a fraction of that when other methods are used on lesions of comparable severity.   Examination of the literature appears to show that other physicians have had the same experience in the few recorded cases in which the intranasal reduction has been applied [15] [16] [18] [20]

It is not my purpose to imply that any one method of treatment will suffice in all maxillo facial injuries, but to demonstrate that an intranasal method of reduction of fractures of the face is a safe, easy, and very frequently successful maneuver requiring minimal manipulation and discomfort to the patient and maximum reduction in hospitalization

Many general rules do not apply in maxillofacial surgery   However, close adherence to surgical principles—so often completely neglected in this type of work—always brings best results   The type of debridement recommended in World War I should be omitted or used cautiously in severe facial injuries for fear of cutting away a feature or exposing an eyeball   The debridement now recommended* consists of careful cleaning, with special attention to "tattooing" from explosions, and the removal of foreign bodies and unattached bony fragments   Leaving in a fragment that may be lost is preferable to cutting away tissue that may live   Chemotherapy and penicillin have been of great value in making this type of debridement possible   Immediate or early cleaning of the tissue is most important as distinguished from debridement as generally practised in areas of less vascularity

At the same time, fractures should be reduced and bony fragments having any periosteal attachments whatsoever replaced   (This practise is not recommended in cases of compounding into the accessory sinuses with intracranial damage)   Repositioning of the orbit, zygoma, nasal bones and palate usually completes the procedure   Protection against accidental malalignment after the reduction must be maintained in a few instances by various methods of internal and external fixation, dental appliances and wiring

I believe that the following rules will serve as a practical guide for treatment

Primary suture   Done on all civilian type injuries of the face not complicated by postponement of definitive treatment more than a day   (Relative contraindications might be the possibility of spreading emphysema or in gross contused lacerations involving the tongue, the lower jaw, and the pharynx   These contraindications may require an open treatment for the best results)

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* Personal impressions as gathered from the lectures and writings of Kazanjian, J B Brown, the Military surgical manuals and military directives

Open treatment. Do not pack open but close in layers outward—first, the mucosa and next, the important structures: nerves, bone, vessels, muscles—over a period of a week or more as the primary reaction subsides. This applies to the following types of cases:

a. Wounds seen late (after 20 hours).

b. War wounds of the "explosive" type, grossly contaminated and severely contused. (Bullet wounds may be of this type.)

c. Severe wounds which are complicated by loss of tissue especially bone and which will be constantly bathed in oral secretions.

PLATE I

(CASE No. 20)

(a) Tripod fracture, left. Note rotation anteriorly and depression of zygoma. Photographed April 28, 1945.

(b) Tripod fracture, left, after reduction by inframeatal, transantral manipulation with a male sound. Photographed May 8, 1945.

d. Wounds complicated by damage to sinuses and to the cranial vault with dural and cerebral lacerations. (Even here, early definitive treatment permits many to be closed. However, bone defects must be a secondary consideration.) When a neurosurgeon is not available, any well-trained surgeon who has given thought to the matter can do a creditable debridement, care for hemorrhage and repair dural tears with fascia lata if needed.

In gross mandibular and maxillary loss, it is important that the soft parts be maintained in functional position *from the beginning* in order to prevent contracture. This may be done by means of prostheses, wire, etc., until plastic replacement of the soft tissue and subsequent bone graft can be made.

The following points need to be emphasized:

1. Immediate or early definitive treatment is best.

2. The use of local anesthesia is to be preferred.

3. Proper airway must be maintained, occasionally by tracheotomy.

4 In civilian injuries, few exceptions exist to the rule of primary suture
5 Morphine is not indicated in wounds of the face or head and its use may be
   fatal

Examination of Tables I and II will illustrate that cases of the severity usually
seen in civil accidents—where available for definitive care by the prescribed
method within two weeks of injury—averaged about 5½ minutes in operating time
and 10 days in the hospital (see cases Nos 9, 11, 12, 16, 20, 21, 23, and 24)

TABLE I*

CASE NO	PRE OP HOSPITALIZATION	TYPE OF OPERATION	OPERAT TIME	POST OP HOSPITALIZATION	REMARKS AND CAUSES OF INJURY
			min		
1	5	Gillies	27	99	Tripod fracture—blow of fist
2	10	1 Submucous & intranasal	55		Tripod fracture (?)—automobile accident (see case report)
		2 Caldwell Luc	35	28	
3	5	Gillies	27	17	Tripod fracture—fall on face
4	5	1 Gillies	23		Tripod fracture—fall from double deck bed
		2 Gillies	21	34	
5	6	1 Caldwell Luc	15		Tripod fracture—collision in base ball game
		2 Gillies	55	33	
6	8	1 Caldwell Luc	35		Tripod fracture (?)—blow of fist (see case report)
		2 Caldwell Luc	30	26	
7	8	Gillies	55	36	Tripod fracture—collision in foot ball game
21	12	Intra oral	?	20	Tripod fracture—collision in base ball game Primary reduction unsatisfactory (see Table II)
8	4	Caldwell Luc	35	26	Tripod fracture 3 years old operated for neuralgia and to relieve anesthesia with improvement
9	1	Gillies	30	13	Tripod fracture—kick Failure to reduce (see Table II)
Average	6		34	33	

* All cases in this table were operated by my predecessors, associates and myself Most
of the cases had general anesthesia but the anesthesia time is excluded from the figures
Also excluded from this table are zygomatic arch fractures and severe injuries with cranial
and frontal damage as they unduly affect operative time and morbidity statistics

Similar cases reduced by other methods averaged 48 minutes in operating time
and spent over 34 days in the hospital (see cases Nos 1, 3, 4, 5, 6, and 7)

Fractures of the face have been successfully reduced by
   (a) External methods (Patterson[1], Matas[2], Gillies[3], Gill[4], Roberts[5], New[6], and
       others)
   (b) Intra oral approach through the buccal fold (Goldthwaite[7], Keen[2] and
       Straith[8])
   (c) Transantral approach via the canine fossa as performed by Lothrop[9],
       Blair and Ivy[10], Naftzger[11], and others

TABLE II*

CASE NO.	PRE-OP. HOSPITA-LIZATION	TYPE OF OPERATION	OPERAT. TIME	POST-OP. HOSPITA-LIZATION	REMARKS AND CAUSES OF INJURY
			min.		
9	3	Intranasal	6	13	Tripod fracture—kick. Secondary reduction (see Table I)
11	1	Intranasal	10	14	Tripod fracture compounded into ethmoid & nose
12	1	Intranasal	8	5	Tripod fracture—fall from a ladder
13	0	Intranasal	165	43	Tripod fracture—jeep accident; severe complicating injuries (see case history)
14	0	Intranasal & other	10 35	35	Tripod fracture, bilateral—motorcycle accident; severe complicating injuries (see case history)
15	2	Intranasal	5	19	Tripod fracture—airship crash; severe lacerations and fractures of nasal bones
16	1	Intranasal	2	11	Tripod fracture—volleyball collision; depressed and rotated
17	7	Intranasal Intranasal	10 ?	120	Tripod fracture—automobile accident; severe lacerations and fractured mandible
18	7	Intranasal & other	6 12	14	Tripod fracture 21 days old (see operation report)
19	5	Intranasal	8	32	Tripod fracture, bilateral—motorcycle accident; complicated by compounding into frontal sinuses
20	1	Intranasal	5	3	Tripod fracture—blow of fist
21	0	Intranasal	5	3	Tripod fracture—collision in softball game. Secondary operation (see Table I and case history)
22	1	Intranasal	10?	18	Tripod fracture 14 days old—fall on car bumper
23	2	Intranasal	12	3	Tripod fracture 14 days old—blow of fist
24	1	Intranasal	7	3	Tripod fracture—fall on floor striking 2 x 4
Average	2		19	22	

* All tripod fractures treated intranasally are included in this Table except Case No. 2. All cases were done under local anesthesia by the author, and directed entirely by him except for Cases Nos. 14 and 17 which were seen in consultation and operated on for the Surgical Service. Anesthesia time (approximating 10 minutes) is not included in the operating time. Lt. Col. Taylor of the Dental Corps was of great assistance in Cases Nos. 14, 17 and 19 in securing dental occlusion and fixation in fractures involving the palate, both maxillae, and the mandible.

Kazanjian[12] [13], Akerman[14], a large number of orthodontists, and others have contributed improvements in immobilization of severe and of old fractures by means of external and intra oral fixation and by the use of headcasts for traction, etc These methods are invaluable when the palate, alveolar arch, and both maxillae are involved, *after failure* of the maneuver recommended in this paper

Shea[15] first described the "very simple method" which is the subject of this paper The method used in Shea's words, ' With one hand external for palpation the sound can be guided in the elevation of the fragments into their places ' needs little modification He adds that, "If the antral wall is partly comminuted I prefer an open operation " Since this report, Shea tells me he has become an advocate of extending the intranasal method more generally Experience with the cases in this series demonstrates that transnasal manipulation may be combined advantageously with any other method of reduction even when complete reduction or fixation is not possible by this maneuver alone Adams[16] reports his experience with the method, Shea[15], in discussion, mentions inflating a balloon in the antrum to maintain proper elevation of the orbital floor where necessary The use of a balloon is also advocated by Johnson[17] who uses it through the canine fossa approach Hoople[18] [19] independently began the use of the malo sound for these fractures and extended its use in military hospitals of the European Theatro of Operations Canfield[20], in charge of otolaryngology for the European Theatre, was impressed by the work being done by Hoople

Adams[16] suggests a solution to the riddle of why this method has been made pendently discovered by several surgeons He states, Lacerations in many cases afford an approach for reduction and immobilization of fractures " etc In my experience, the sharp edge of the bony nasal orifice has cut through tho cheek and the upper lip like a knife, following frontal face injuries, exposing, when retracted, the underlying fractures This makes an entrance into the antrum through the fracture, for elevation of the orbital margin and for remolding the malar eminence, a simple matter Compounding into the mouth or further stripping the periosteum is avoided and viability of the comminuted bony fragments is enhanced Immediate suture is thus possible without drainage as the large, intranasal (temporary) window in the nose offers a sufficient outlet for blood and secretions from the maxillary sinus

SURGICAL ANATOMY

The malar eminence spoken of by Ungley[21] as the ' zygomatic tripod," is most commonly separated by a fracture from its three attachments of compact bone the zygoma, the lateral orbital margin, and the inferior orbital margin Visualizing the antral surface of this roughly triangular structure, a concavity is found beneath the orbital ridge and a firm, bony surface—the zygoma—, against either of which considerable pressure with a curved instrument can be exerted, if necessary, to reposition the "tripod"

In practice, many early, simple fractures seem to snap back into normal position with no tendency to recurrence of deformity (all but two cases in the series listed in Table II) In my experience, the direction of the displacement is unimportant

PLATE II
(CASE No. 15)

(a) Compound, comminuted fractures of right zygomatic tripod, photographed 24 hours after injury and before reduction. Note divergence from the vertical of the straight edge on the patient's right.

(b) The urethral sound has been passed through the inferior meatus and the curved tip is against the right lateral antral wall. The left thumb should be used as a fulcrum to prevent excessive pressure on the septum and on the nasal spine. (The instrument in the operator's left hand is a nasal speculum.)

(c) Photographed a few minutes after reduction. The straight edges approximate the same angle of divergence from the vertical when held in any identically corresponding position.

in influencing the ease with which reduction is carried out. However, the age of the injury is an important consideration. Fractures two weeks old may be difficult (see Cases Nos. 22 and 23). In older fractures it may be advisable to use a method in which fixation of fragments is possible but I have found no contraindication to a preliminary trial of intranasal reduction (see Case No. 18).

In more severe comminuted fractures, the thin orbital floor and the face of the canine fossa are easily smoothed out from within the antrum and, when properly aligned, have a remarkable tendency to hold a normal position without support

It is important to remember that the orbital floor and the face of the lateral and anterior walls are easily penetrated This difficulty can usually be avoided by taking care in placing the instrument against the compact bone of the "tripod" Even in cases where fractures of these thin walls has occurred, there has been no untoward result and, in one case (No 18) where reduction was difficult because the fracture was old, deliberate fracture seemed to be of assistance in the reduction

DIAGNOSIS

A proper evaluation of the injury is essential and the common diagnostic points outlined by Ungley[21], Coakley[24], and others warrant consideration

A simple, depressed, triple fracture of the zygomatic arch from a blow on the side of the head is not amenable to intranasal reduction * Canfield[20] cautions that in war wounds or in penetrating wounds, foreign bodies in the antra must be considered and may demand exploration through the canine fossa

Special handling is required in cases involving extensive comminution, in palatal and in mandibular injuries, and in more severe complications such as gross loss of tissue The fact is emphasized, however, that reduction of the deformity with the intranasal sound is helpful in reducing surgical shock by assisting in the *earliest possible* restoration of the functional position of displaced parts—just as early reduction by proper methods is helpful in other major bone injuries (see Cases Nos 13 and 14)

In the cases under consideration, diagnosis is based on the following

(a) Facial deformity in fracture of the "tripod" is usually obvious but may be masked by swelling (cases Nos 20 and 15, Plates I and II respectively) In injuries with slight deformity or where masked by swelling, the deformity can be visualized by applying two, thin, straight edges (yard sticks) to the sides of the face (Plate II) Corresponding bony landmarks on the skull, as a fixed point, on the zygoma or inferior orbital margin, must be selected The angle formed by the sticks, compared with an imaginary, vertical line from the top of the head, is exaggerated by the length of the stick and shows the upper portion of the yard stick on the fractured side deviating away from the vertical line in an obvious manner (Plate II, a and c)

(b) Palpable fracture lines along the orbital margins and the zygomatic arch are diagnostic

(c) The infra-orbital nerve is frequently involved as the canal in which it runs weakens the orbital margin and fractures are common at this point

*   been a factor, in my experience, when reducing fracture depressions of the zygoma through the mouth

Early reduction usually avoids prolonged or permanent infraorbital nerve symptoms.

(d) Emphysema is not uncommon but is of no value in estimating a deformity. (Patients should be cautioned against blowing the nose.)

(e) Interference with mandibular function indicates a depressed zygoma. If the "tripod" is not part of the depressed zygomatic fracture, an attempt at intranasal reduction will fail. (Trismus may be present in maxilla and palate injuries.)

(f) Hemorrhage into the antrum, when present, makes a "tripod" fracture more likely, and intranasal reduction is doubly helpful in permitting intranasal drainage.

(g) Diplopia may be caused by displacement of the inferior oblique attachments or of the orbital floor. (Occasionally the eye is displaced into the antrum. See Case No. 14. In one case, not included in this series and handled by the Surgical Service, both eyes were displaced into the antra; the ruptured left eyeball was not identified for several weeks!)

(h) X-rays taken carefully in several positions are of the greatest value. (Occasionally, deformity is surprisingly difficult for the roentgenologist to demonstrate.)

INSTRUMENTS

The proper selection of the instrument for making pressure is important. It is significant that all operators who use the intranasal approach have independently selected male sounds (Plate IIb) as the most convenient instruments. Selecting the sound which is best adapted for the job at hand is essential. Special consideration is given to the length of the curved tip. On one occasion, however, a Cushing scalp retractor was necessary in order to successfully lift a comminuted portion of the inferior orbital ridge close to the nose (Case No. 21). A curved hemostat sufficed in one case with severe compound comminutions (Case No. 13); in another case, a curved, kidney pedicle clamp was used (Case No. 14).

OPERATION

Preparation for operation consists of a 10% cocaine pack, as for an antrotomy, and injection of 1% procaine (novocaine) directly through the overlying skin into the principal fracture lines. This is preceded by morphine sulphate, gr. $\frac{1}{7}$, and scopolamine, gr. $\frac{1}{150}$, except in cases treated immediately in which shock is a factor and previous medication a question. In my experience with these cases, repositioning the bones with only a little cocaine, locally administered, exerts a favorable influence in the general condition of the patient in shock (Cases Nos. 13 and 14).

Although the intranasal zygomatic tripod reduction lends itself most readily to manipulation by the trained rhinologist, more severe injuries frequently suffer from unwarranted delays while awaiting consultation with orthodontists, ophthalmologists and neurosurgeons (Case No. 17). *Immediate* or early restoration

of the orbital contents to its normal position, manipulation of the palate and maxilla into dental occlusion, exploration of frontal injury, dural tears and brain lacerations*, and immediate definitive treatment will save lives and prevent weeks or months of unnecessary suffering The maxillo-facial surgeon or the rhinologist interested in this work could well prepare himself to carry out these procedures, most of which are simple enough when the principles of surgery are understood

COMMENTS

1 Comparison of this series of cases operated intranasally with cases treated in other ways shows that many ingenious methods of reductions of simple tripod fractures are unnecessarily complicated and morbidity needlessly prolonged

2 Delay in definitive treatment increases the number of operative procedures and prolongs morbidity further

3 The rhinologist or the maxillo facial surgeon whose practice includes this type of work can improve his results by a study of the case histories of many excellent surgeons and by adopting the best method suited to his surgical facility Severe injuries can be handled better if the surgeon has had experience with head injuries, and is familiar with the principles of orthodontia

Note Five cases seen in the past year confirm the findings outlined in this paper

CASE REPORTS

Case No 1 History —White male 42 years of age, injured by blow on face on April 21 His left eyelid swelled a little at that time but did not shut his eye completely and his vision was unimpaired The swelling was stopped by applying a cold towel on the eye The following afternoon, at 2 30 P M , upon blowing his nose, the left lower lid immediately ballooned up, in addition a slight epistaxis occurred from the left nostril The process of blowing the nose was repeated several times and blood was passed from the left nostril each time for the following two hours, following which the left upper lid also ballooned out shutting the left eye completely A medical officer was seen at 4 30 P M who cautioned him to stop blowing his nose and advised entrance into the hospital

Admitted —April 22, 1943

Diagnosis —Fracture, comminuted, simple, complete of the left zygoma

Operation —On April 29, 1943 an open reduction of the fracture performed, length of time 27 minutes, anesthesia used sodium pentothal About a 1½" incision was made within the hairline above the temple, temporal fascia was incised and instruments for reduction in serted between fascia and muscle The fractures were reduced However, a notch in the inferior orbital ridge could not be entirely eliminated The closure was made with black silk

Postoperative diagnosis was fracture of the left zygoma and the maxillary antrum The bone was fractured in three places at the root, through the midportion of the arch, and through the antrum at the malar attachment

Discharged —August 6, 1943

Case No 2 History —White male, age 22, injured when auto in which he was riding collided with a truck at about 10 30 P M on April 29, 1943

Admitted —April 20, 1943

* *

   * 5 years

Diagnosis.—1. Fracture, simple, complete, of the inferior portion of the lateral wall of the left maxillary sinus with moderate displacement and moderately severe.

2. Wound, lacerated, on left forehead, chin, left hand and left forearm, moderate.

3. Contusion of left upper eyelid, mild.

Operation.—(1) Partial submucous resection, nasal autrotomy and reduction of fracture, under cocaine 20% spray, procaine 1% 0.5 cc., on April 30; time 55 minutes. Submucous resection was necessary to gain access to the inferior meatus. Inframeatal antrotomy was performed. The mucous membrane in the antrum was swollen. Some sanguinous secretion was present. The depressed outer portion of the antrum was elevated. The impression was obtained that part of the fractured anterior wall was loose and unattached to the surrounding bone; this, however, was in fairly good position. On May 7, a loose piece of bone could still be palpated in the anterior wall of the left antrum. Postoperative diagnosis was fracture of maxillary antrum, left, involving anterior surface.

(2) A Caldwell-Luc was performed on May 20 for the removal of the displaced fragment of bone; time 35 minutes; anesthesia was cocaine and procaine. An incision was made in buccal-gingival groove. The anterior wall of the antrum was found to have several comminuted fractures. One large piece of bone was located laterally and inferiorly. This was separated, displaced forward, and removed. The closure was made with black silk.

Discharged.—May 28, 1943.

Case No. 3: History.—White male, age 39, injured at 11:00 P.M. on August 17 from a fall while running for a bus. Severe pain developed in the morning in the left cheek along with swelling, numbness and palsy of the left muscles of the face.

Admitted.—August 18, 1943.

Diagnosis.—Fracture, simple, complete, of the left zygoma.

Operation.—On August 23, 1943, an elevation of the depressed, fractured zygoma was performed by the Gillies method, under sodium pentothol anesthesia; length of time, 27 minutes. An incision of one inch was made in the temporal hairline into the temporal fascia. A blunt separator was passed behind the body of the zygoma and the bone elevated and rotated for a distance of about 1 cm. Excellent results were obtained.

Discharged.—September 9, 1943.

Case No. 4: History.—White male, 46 years of age, injured on the morning of November 13 by falling out of a double-decker bed.

Admitted.—November 13, 1943.

Diagnosis.—X-ray of the facial bones on November 17 revealed a comminuted fracture of the medial half of the superior wall of the right antrum (communicating with the orbit) involving the infero-lateral wall of the same antrum. There was also a separation of the zygoma and the frontal bone at the suture line with a gross (4 mm.) medial displacement of the zygoma. Separation at the suture line between the zygomatic arch of the temporal bone and the body of the zygoma was also present. There was also a fracture involving the posterior portion of the zygomatic arch.

Operation.—(1) An open reduction through a Gillies approach was performed on November 18, under pentothol sodium 0.8 gms.; length of time 23 minutes. The mesial portion of the zygomatic arch and the lateral third of the zygomatic body, involving the frontal process, were displaced, rotated and impacted inward. The incision was made within the hairline, high in this instance to avoid very large veins. Considerable force was needed to elevate the bones which apparently were fixed because of impaction. The closure was made with zero chromic and black silk.

The patient continued to complain of pain in the right antrum and in the zygomatic area and of numbness extending over the right upper lip.

(2) Although the above-mentioned depression of the frontal process of the right zygoma was slight, a Gillies approach for correction was performed on December 1, 1943, under pentothol sodium anesthesia, ¼ gms. The numbness disappeared and the result has been satisfactory.

Discharged.—December 22, 1943.

Case No 5 History—White male, 37 years of age, injured on January 28 while playing baseball

Admitted January 28, 1944

Diagnosis —1 Fracture, multiple, comminuted, of the anterior lateral walls of right maxillary sinus, incomplete

2 Fracture, simple depressed, complete right zygoma

3 Contusion, right eye, severe

Operation —(1) The anterior wall of the antrum was exposed by the Caldwell Luc approach oo February 3, 1944, under 20% cocaine sproy and 1% procaine 3 0 cc There were multiple fractures and inward displacement of the anterior wall, particularly laterally and inferiorly The antrum was entered, loose pieces of bone removed, and an old clot of blood aspirated from the antrum An attempt to elevate the lateral wall, which is part of the body of the malar bone, was accomplished in part The zygomatic malar root, which was depressed, could not be elevated completely

X rays taken February 11, showed the antral displacement to be corrected but the zygomatic depression remained

(2) Elevation of fracture by Gillies' technique under sodium pentothol anesthesia, length of time 55 minutes

Discharged —March 8, 1944

Case No 6 History —White male, age 21, injured when struck by another man

Admitted —May 4, 1944

Diagnosis —1 Fracture, simple, complete, right maxillary sinus and right infra orbital ridge

2 Hematoma, traumatic, moderately severe, subconjunctival, of both eyes

Operation —(1) Elevation of the fracture by the Caldwell Luc technique performed on May 11, 1944, under procaine 1% 15 0 cc , length of time 25 minutes The usual incision was made and, on elevation of the periosteum from the face of the right antrum, the fracture line was easily found The fractured fragment was over riding inferiorly and medially on the intact medial portion of the anterior antral wall The sinus was entered by removing some bone from the intact portion Hemorrhagic thickening of the mucous membrane in the lateral portion of the sinus was then removed By means of a curved elevator, the fractured segment was then elevated and the entire antral cavity was firmly packed with an iodoform gauze strip Because the packing is left in situ and the antrum is draining into the buccal cavity, no inferior meatal antrotomy was performed No sutures were placed

X rays taken May 19 disclosed an incomplete reduction of the superior fragment, anteriorly

(2) Secondary correction of fracture of antrum was performed on May 20, 1944, under sodium pentothol 0 6 gm , length of time 7 minutes Results satisfactory

Discharged —June 6, 1944

Case No 7 History —White male, age 28, injured when his face struck another player during a football game on June 19 Immediate pain and numbness of the right face occurred He had no double vision

Admitted —June 19, 1944 and transferred June 23, 1944

Diagnosis —Fracture, comminuted, of the right malar bone

Operation —On June 28, a Gillies' operation for correction of a fracture of the zygoma was performed under avertin 3 0 cc , length of time 55 minutes The Caldwell Luc approach was used for the correction of the fractures of the maxillary bone The presence of edema was observed in the region of the zygoma before the operation An incision was made in the hairline in the temple region The mesial portion . . . . . pressed outer portion of the zygoma were elevated . . . . . showed depressed, multiple, comminuted fractures . . . . . removed and the anterior and inferior orbital ridge were elevated There appeared to be a lack of continuity of the bone of the floor of the orbit The lateral wall of the antrum

Diagnosis.—1. Fracture, simple, complete, of the inferior portion of the lateral wall of the left maxillary sinus with moderate displacement and moderately severe.

2. Wound, lacerated, on left forehead, chin, left hand and left forearm, moderate.

3. Contusion of left upper eyelid, mild.

Operation.—(1) Partial submucous resection, nasal antrotomy and reduction of fracture, under cocaine 20% spray, procaine 1% 0.5 ce., on April 30; time 55 minutes. Submucous resection was necessary to gain access to the inferior meatus. Inframeatal antrotomy was performed. The mucous membrane in the antrum was swollen. Some sanguinous secretion was present. The depressed outer portion of the antrum was elevated. The impression was obtained that part of the fractured anterior wall was loose and unattached to the surrounding bone; this, however, was in fairly good position. On May 7, a loose piece of bone could still be palpated in the anterior wall of the left antrum. Postoperative diagnosis was fracture of maxillary antrum, left, involving anterior surface.

(2) A Caldwell-Luc was performed on May 20 for the removal of the displaced fragment of bone; time 35 minutes; anesthesia was cocaine and procaine. An incision was made in buccal-gingival groove. The anterior wall of the antrum was found to have several comminuted fractures. One large piece of bone was located laterally and inferiorly. This was separated, displaced forward, and removed. The closure was made with black silk.

Discharged.—May 28, 1943.

Case No. 3: History.—White male, age 39, injured at 11:00 P.M. on August 17 from a fall while running for a bus. Severe pain developed in the morning in the left cheek along with swelling, numbness and palsy of the left muscles of the face.

Admitted.—August 18, 1943.

Diagnosis.—Fracture, simple, complete, of the left zygoma.

Operation.—On August 23, 1943, an elevation of the depressed, fractured zygoma was performed by the Gillies method, under sodium pentothol anesthesia; length of time, 27 minutes. An incision of one inch was made in the temporal hairline into the temporal fascia. A blunt separator was passed behind the body of the zygoma and the bone elevated and rotated for a distance of about 1 cm. Excellent results were obtained.

Discharged.—September 9, 1943.

Case No. 4: History.—White male, 46 years of age, injured on the morning of November 13 by falling out of a double-decker bed.

Admitted.—November 13, 1943.

Diagnosis.—X-ray of the facial bones on November 17 revealed a comminuted fracture of the medial half of the superior wall of the right antrum (communicating with the orbit) involving the infero-lateral wall of the same antrum. There was also a separation of the zygoma and the frontal bone at the suture line with a gross (4 mm.) medial displacement of the zygoma. Separation at the suture line between the zygomatic arch of the temporal bone and the body of the zygoma was also present. There was also a fracture involving the posterior portion of the zygomatic arch.

Operation.—(1) An open reduction through a Gillies approach was performed on November 18, under pentothol sodium 0.8 gms.; length of time 23 minutes. The mesial portion of the zygomatic arch and the lateral third of the zygomatic body, involving the frontal process, were displaced, rotated and impacted inward. The incision was made within the hairline, high in this instance to avoid very large veins. Considerable force was needed to elevate the bones which apparently were fixed because of impaction. The closure was made with zero chromic and black silk.

The patient continued to complain of pain in the right antrum and in the zygomatic area and of numbness extending over the right upper lip.

(2) Although the above-mentioned depression of the frontal process of the right zygoma was slight, a Gillies approach for correction was performed on December 1, 1943, under pentothol sodium anesthesia, ¼ gms. The numbness disappeared and the result has been satisfactory.

Discharged.—December 22, 1943.

Case No 5 History—White male, 37 years of age, injured on January 28 while playing baseball

Admitted January 28, 1944

Diagnosis—1 Fracture, multiple, comminuted, of the anterior lateral walls of right maxillary sinus, incomplete

2 Fracture, simple depressed, complete right zygoma

3 Contusion, right eye severe

Operation—(1) The anterior wall of the antrum was exposed by the Caldwell Luc approach on February 3, 1944, under 20% cocaine spray and 1% procaine 3 0 cc There were multiple fractures and inward displacement of the anterior wall particularly laterally and inferiorly The antrum was entered, loose pieces of bone removed, and an old clot of blood aspirated from the antrum An attempt to elevate the lateral wall which is part of the body of the malar bone, was accomplished in part The zygomatic malar root which was depressed, could not be elevated completely

X rays taken February 11, showed the antral displacement to be corrected but the zygomatic depression remained

(2) Elevation of fracture by Gillies' technique under sodium pentothol anesthesia, length of time 55 minutes

Discharged—March 8, 1944

Case No 6 History—White male age 21, injured when struck by another man

Admitted—May 4, 1944

Diagnosis—1 Fracture, simple, complete, right maxillary sinus and right infra orbital ridge

2 Hematoma, traumatic, moderately severe subconjunctival, of both eyes

Operation—(1) Elevation of the fracture by the Caldwell Luc technique performed on May 11, 1944, under procaine 1% 15 0 cc, length of time 25 minutes The usual incision was made and, on elevation of the periosteum from the face of the right antrum, the fracture line was easily found The fractured fragment was over riding inferiorly and medially on the intact medial portion of the anterior antral wall The sinus was entered by removing some bone from the intact portion Hemorrhagic thickening of the mucous membrane in the lateral portion of the sinus was then removed By means of a curved elevator, the fractured segment was then elevated and the entire antral cavity was firmly packed with an iodoform gauze strip Because the packing was left in situ and the antrum was draining into the buccal cavity no inferior meatal autrotomy was performed No sutures were placed

X rays taken May 19 disclosed an incomplete reduction of the superior fragment, anteriorly

(2) Secondary correction of fracture of antrum was performed on May 20, 1944, under sodium pentothol 0 6 gm , length of time 7 minutes Results satisfactory

Discharged—June 6, 1944

Case No 7 History—White male, age 28 injured when his face struck another player during a football game on June 19 Immediate pain and numbness of the right face occurred He had no double vision

Admitted—June 19, 1944 and transferred June 23, 1944

Diagnosis—Fracture, comminuted, of the right malar bone

Operation—On June 28, a Gillies' operation for correction of a fracture of the zygoma was performed under avertin 3 0 cc , length of time 55 minutes The Caldwell Luc approach was used for the correction of the fractures of the maxillary bone The presence of edema was observed in the region of the zygoma before the operation An incision was made in the hairline in the temple region The mesial portion of the zygomatic arch and the depressed outer portion of the zygoma were elevated The anterior and the superior walls showed depressed, multiple, comminuted fractures Part of the fractured anterior wall was removed and the anterior and inferior orbital ridge were elevated There appeared to be a lack of continuity of the bone of the floor of the orbit The lateral wall of the antrum

was also depressed and was elevated. The antrum was packed with iodoform gauze with the bones elevated.

The patient complained of double vision. Eye examination showed diplopia, left, all fields; definite limitation of the motion of the eyeball, especially down and out; no definite muscle palsy; condition believed due to edema of the orbit. The suggestion was made that the packing be removed from the antrum as soon as possible.

On July 7, under pentothol anesthesia, about 15″ of iodoform packing was removed from the right antrum; a small portion was allowed to remain.

On July 19, under 1% procaine, closure of the incision was made. The patient was cured upon completion of the case.

Discharged.—August 3, 1944.

Case No. 8: History.—White male, age 29. In 1941, the face was traumatized, resulting in a fracture of the left maxilla No surgery was performed. Pain in the cheek existed from time of the accident, becoming progressively worse. In 1943, absolute alcohol was injected into the infra-orbital nerve which brought relief for two days. Pain had not receded but had become progressively worse and involved the left cheek, the lower eyelids, the left lateral aspect of the nose, and the left upper lip.

Admitted.—September 4, 1944.

Diagnosis.—1. Fracture, faulty union, simple maxilla and zygoma, left, through infra-orbital foramen caused by old injury (1941) to face.

2. Neuralgia, moderate, left, of the infra-orbital nerve, cause secondary to (1).

Operation.—A modification of the Caldwell-Luc was performed on September 8, 1944 under sodium pentothol, 1% procaine with adrenalin, amount q.s.; length of time 35 minutes. The fracture was found well-healed in the abnormal position, and repositioning the bone in its normal facial contour would have been very difficult; no attempt was made in this direction. A window was made into the canine fossa and the bone removed to the lower edge of the infra-orbital foramen. The nerve was isolated from the soft parts in this immediate vicinity and the bone around it was removed with rongeurs and curettes, the nerve being freed along the canal of the anterior maxillary roof. The normal mucosa of the antrum was disturbed only superiorly where the nerve was overlaid by it. An infra-meatal window was made into the nose. No drainage was used.

Discharged.—October 4, 1944.

Case No. 9: History.—Colored male, age 27, injured by kick in the face on October 14.

Admitted.—October 17, 1944.

Diagnosis.—Fracture of the left maxilla and zygoma, compound, into antrum, comminuted, moderate.

Operation.—On October 18, an incision was made in the skin at the hairline just anterior to the left ear. The fascia overlying the temporal muscle was incised. An elevator was then inserted in this plane beneath the zygoma and the latter was raised.

On October 21, an open treatment of the fracture was done with moulding over a male sound. Under local anesthesia, an opening was made into the antrum through which a No. 24 curved male sound was introduced and forceful pressure made against the lateral antral wall. Sensation of movement under the fingers together with relocation of the bone in the normal position indicated the completion of the operation.

Discharged.—October 31, 1944.

Case No. 11: History.—White male, injured in a jeep accident.

Admitted.—February 5, 1944.

Diagnosis.—Fracture of maxilla and zygoma.

Operation.—Reduction was performed on February 6. There was a fracture through the orbit with marked depression of the inferior orbital ridge. The fracture extended laterally into the zygoma and medially into the ethmoid. The fragments were replaced by manipulation through the antrum under the inferior turbinate with a male sound. The lateral nasal wall was pushed over against the septum and had to be replaced also. Anesthesia was cocaine 5%, procaine 1%; length of operation 10 minutes.

Discharged —February 20, 1944

Case No 12 History —White male, age 32, injured by a fall from a ladder

Admitted —June 29, 1944

Diagnosis —Fracture, compound, comminuted of the nasal bones and the nasal maxillary process (tripod fracture) Wound, laceration, moderate, of the forehead

Operation —On June 30, an intranasal reduction of the maxillary fracture was performed and manipulation of the nasal bones done, length of time 8 minutes

Discharged —July 5, 1944

Case No 13 History —White male, age 22, injured in a jeep accident

Admitted —September 8, 1944

Diagnosis —1 Fracture, comminuted, compound, complete of the nasal bones, bilateral, and of the maxilla, left

2 Wound, lacerated, dorsum, left hand and extensor tendon of index finger

Operation —On September 8, 1944, debridement and reduction of the fracture of the maxilla and the nasal bone was performed under procaine 1%, 12 cc , length of time 2 hours and 45 minutes The inferior orbital margin and orbital process of the maxilla were exposed by a compound, comminuted fracture The entire maxillary dental arch was displaced and impacted, being rotated upward in an anterior aspect A few loose pieces of maxilla were removed and the orbital margin was elevated by a large, curved clamp through the left nares The compound, comminuted nasal bones were also molded into shape in the midline and packed open with vaseline and balsam of Peru gauze packs Free drainage was left Six skin sutures were arranged to partially hold the multiple, severe, contused lacerations about the nose in place

Discharged —October 21, 1944

Case No 14 History —White male, age 24, injured in a motorcycle accident on September 13

Admitted —September 13, 1944

Diagnosis —Fracture, comminuted, complete, of the maxilla, right and left, compounded into the mouth and the nasal cavities

Operation —(1) On September 13, an emergency operation was performed under sodium pentothal which disclosed a fracture of the maxilla on the right extending through the mid-palate bone and through the orbital ridge which as in good position, fractured nasal bones in fair position but palate remaining open The recommendation was made that dental fixation of the maxilla be attempted, possibly by use of an available plate

On September 14 in the Dental Clinic, a closed treatment of the fracture was performed with continuous wire loops and elastics

On September 19, re examination showed the plate had slipped down on the left side increasing the displacement in the left orbital ridge fracture which was originally pushed up into line This displacement had been followed by dropping of the eye and of the orbital floor downward and inward

(2) On September 20, a kidney pedicle clamp, full curved, was inserted through the inferior meatus of the left lateral antral wall, which had been crushed by the injury, and the fragments were manipulated into place by manual manipulation against the point of the clamp There was minimal bleeding The eyeball moved normally and diplopia disappeared The palate was pushed upward and an artificial denture inserted The teeth previously wired were held together with rubber bands A plaster headrest was put on with lateral attachments for supporting the chin bandage

Discharged —October 18, 1944

Case No 15 History —White male, age 27, injured during forced landing on October 24

Admitted —October 24, 1944

Operation —Reduction of fracture performed October 26 for fracture of maxilla and zygoma with depression, operating time 5 minutes Under morphine ¼ gr , hyoscine 1/150 gr and nembutal 1½ gr , supplemented by 5 cc of procaine 2% distributed into the sites of the

fractures and the infra-orbital nerve and 20% cocaine under the inferior turbinate, an opening was made into the antrum through which a No. 24 male sound, curved, was introduced and forceful pressure applied against the lateral antral wall. Sensation of movement under the fingers, with relocation in normal position of the bone, indicated the completion of the operation.

Discharged.—November 14, 1944.

Case No. 16: History.—White male, age 35, injured playing volleyball.

Admitted.—November 17, 1944.

Diagnosis.—Fracture, compound, complete, of the left maxilla.

Operation.—On November 18, an open treatment of the fracture was performed by inframeatal instrumentation and molding with the fingers. Under procaine 1% into the lines of fracture and cocaine 20% into the inferior meatus, the antrum was opened and a large male sound passed through the opening and the fragments elevated and molded into place manually.

Discharged.—November 28, 1944.

Case No. 17: History.—White male, age 24, injured in an automobile accident on November 26.

Admitted.—November 28, 1944.

Diagnosis.—Fractures of both maxilla and mandible and severe laceration of the face in the right infra-orbital area.

The extensive compound, comminuted fracture of both the mandible and maxillae were wired into position by the dental surgeon.

Operation.—(1) On December 2, 1944, reduction of the depressed fracture of the right zygoma and orbital margin was attempted by means of inframeatal manipulation with the male sound and manual manipulation of the fragment externally. A plaster cast was placed about the head to assist in immobilization of the jaw and to protect the right maxilla from external pressure after molding the severely comminuted fractures. On December 21, the progressive marked edema of the right lower lid was thought to be due to a combination of pressure and lymphatic blockage by the scar resulting from the laceration.

(2) On February 14, 1945, another attempt was made to reduce the fracture of the right maxilla and eliminate the deformity caused by this fracture. This was done by an open reduction through the right antrum with the incision being made above the upper first molar on the right. The scar was freed from the underlying bone in the hopes that this, too, would help relieve the cicatricial deformity. The zygoma was packed into position, using about a foot of penrose tubing with a thin gauze core. This packing was removed on February 20. Following this second procedure, the swelling of the eye decreased greatly and there was much less retraction of the scar. However, considerable deformity of the orbital margin remained with depression of the lower right lid and moderate tearing of the right eye. Only a small area of anesthesia remained just to the left of the old scar below the right eye.

Discharged.—April 1, 1945.

Case No. 18: History.—Male white, age 28, injured November 26.

Admitted.—December 7, 1944.

Diagnosis.—Fracture, compound, comminuted, of the right maxilla and zygoma.

Operation.—On December 14, 1944, open treatment of the fracture was performed by refracture of the zygomatic arch and maxillary portion with the chisel and elevating into position through antrotomy opening. A vertical, gingival incision was made over the face of the left antrum. The periosteum was separated from loose fragments of the maxilla and the outer fracture line was felt with the chisel and freed by means of a few blows with a mallet. The rubber-covered, straight instrument was inserted into the antral opening and the orbital margin was elevated into position without difficulty. There seemed to be no reason for any fixation and so the wound was allowed to fall together without sutures or drainage. Local anesthesia was used: procaine 1% with adrenalin 15 cc.

(Note An attempt to reduce this fracture in the chair a day or so before failed with the intranasal technique)

Discharged—December 28 1944

Case No 19 History—White male age 20, thrown from motorcycle about 10 30 P M on March 1, 1945 and unconscious for a short while Emergency care was received for multiple facial fractures lacerations and abrasions and wounds sutured

Admitted—March 3 1945 at 12 30 P M

Diagnosis—X rays showed oblique fracture of the second right metacarple fracture of the junction of the frontal and nasal bones invading the frontal sinus with posterior displacement of the nasal bone separation at the junction of the frontal and malar bones a comminuted fracture extending vertically through the malar bone on a line with the lateral wall of the orbit a fracture involving the floor of the orbit comminuted fracture of the antrum with cloudiness of the antrum indicative of hemorrhage clouding in the ethmoid sinuses due to a fracture involving the medial wall of the right orbit and a comminuted fracture of the left antrum with cloudiness of the antrum indicative of hemorrhage

On March 8 1945 the teeth were wired

Operation—On March 9 1945 under procaine anesthesia the antra were opened small intranasal windows made and the nasal bones further elevated Length of operating time 8 minutes The wiring with elastic traction pulled the maxilla down into position and teeth showed good occlusion when the wires were removed on April 3

Discharged—April 10 1945

Case No 20 History—White male age 26 injured by a blow from fist about 11 30 P M on April 26 1945

Admitted—April 27 1945

Diagnosis—X rays showed double fracture of the zygomatic arch with depression inferiorly and medially fracture of the infra orbital margin and floor of the orbit and invasion of the maxillary sinus

Operation—On April 28 a closed treatment of the fracture was performed with a male sound through the left antrum and with manual external manipulation, operating time 5 minutes, anesthesia used procaine 1% 10 cc at site of fracture and cocaine 20% in nasal wall Some difficulty was experienced in reducing this fracture which was fairly far back over the zygoma After loosening it with this maneuver the sound was placed in the fornix of the left cheek and the zygoma moved further into the normal position

Discharged—May 1 1945

Case No 21 History—Male white age 19 injured in collision during baseball game on May 5

Admitted—May 22 1945 by transfer from another hospital

Diagnosis—Wound contused over the left eye secondary to fracture comminuted, complete of the left zygoma

X ray following in attempted reduction on May 17 showed no improvement in position of fracture

Operation—On May 22 1945 elevation of the fracture of the left inferior orbital margin was accomplished under novocaine and cocaine in the nose A male sound was inserted under the inferior turbinate and an effort made to reduce the fracture by means of manual manipulation externally This procedure was immediately discontinued as the depression of the orbital ridge did not come into line A more curved instrument* was then inserted and the bone elevated into position without any difficulty

Discharged—May 26 1945

Case No 22 History—White male age 28 injured when he slipped and fell against auto bumper on July 19 1945 The following day the right side of his face was numb and tingling and a great deal of pain developed on the right side of the face when chewing, and blood was blown from the right nostril The symptoms persisted

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* Cushing Scalp Retractor

Admitted.—July 31, 1945.

Diagnosis.—Fracture of the maxilla and zygoma, right, compounded into the antrum, depressed, with depression of the infra-orbital margin and the maxillary eminence downward and inward.

Operation.—On August 1, 1945, replacement of the fracture fragments was performed under local anesthesia. The nasal antral wall was entered, first with an antral trochar and then with a male sound, and the maxilla elevated into position. As this procedure was not completely satisfactory, a small incision was made in the mucosa of the fornix of the right cheek and the zygoma further elevated by this maneuver.

Discharged.—August 20, 1945.

Case No. 23: History.—White male, age 29, injured by blow to face two weeks previous. The chief complaint was difficulty in chewing.

Admitted.—June 12, 1946.

Diagnosis.—Fracture, depressed, of the left malar and zygoma.

Operation.—The fracture was elevated on June 14, 1946, by the intranasal approach with a No. 24 curved male sound, under local anesthesia.

Discharged.—June 17, 1946.

Case No. 24: History.—White male, age 34, injured by falling and striking his face against a two by four scantling.

Admitted.—September 12, 1946.

Diagnosis.—Fracture, depressed, left malar and zygoma.

Operation.—On September 13, 1946, reduction of malar fracture performed with a male sound, under local anesthesia.

Discharged.—September 16, 1946.

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COMPOSITE BONE GRAFT IN SADDLE NOSE

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In discussing the reconstruction of saddle nose, one must necessarily classify saddle noses into their respective varieties.

The first and perhaps simplest is the saddle nose following extensive or faulty submucous resection.

2. Saddle nose deformities secondary to infection with resultant absorption of the septal cartilage.

3. Saddle nose deformities following trauma. These may involve the cartilage separately or the cartilage and bone, and include saddle nose deformities as a result of accidents, crash injuries and explosions.

4. Saddle nose deformity secondary to syphilis with absorption or destruction of the cartilage alone or the cartilage and bone or the bone alone as in one of the author's cases.

5. Saddle nose deformity as a complication of faulty or extensive rhinoplastic correction.

6. Saddle nose deformity as a sequela to metabolic diseases, such as, diabetes, leukemia, tuberculosis or other medical diseases.

7. Saddle nose deformity as a sequela to malignancy, x-ray therapy, radium, or a combination of these.

8. Saddle nose deformity as a result of hematoma, traumatic or surgical or medical as in cases of purpura or hemophilic disturbances.

9. Saddle nose deformity secondary to bone pathology or cartilaginous pathology as cyst, or other types. Obviously, the causes of saddle nose are many.

The application of the particular composite bone graft procedure mentioned in this article is applicable to the correction and reconstruction of most of those mentioned with perhaps exceptions of cancer, syphilis, and tuberculosis. However, the writer has used onlay grafts in one case of syphilitic nose (destruction of bone). In reconstructive surgery, where cancer has caused destruction of the bone, bone graft reconstruction can be utilized if the disease has been eradicated.

SITE OF PREDILECTION FOR BONE GRAFT MATERIAL

The rib proper offers one site for the selection of bone graft material, likewise the iliac crest is the second site of election. In the past, many bone grafts to the nose have been secured from the anterior tibial surface. Even preserved bone offers another source of procuring bone material. Use of vomer bone results in absorption (author's experience). Dorsal bone from humped noses is successful, primarily as autogenous grafts. Inasmuch as the writer has had great success with the procurement of bone material in the iliac bone, this paper will be limited to that source as procurement.

PROCUREMENT OF GRAFT

Preparation

The hip region is prepared and isolated according to the technic for any bone procedure   The securing of the bone graft is possible before any work is done upon the nose   Figure 1 represents in *A* and *C* the mapping out of the *crest bone block* after the wound has been opened and the periosteum over the iliac crest removed   *B* represents the *convergence of chisels* in the *bone block ostectomy*   This convergence is so arranged as to be entirely within the confines of the inner and outer table of the ilium, the apex point being approximately 1 to 1½ inch from the surface of the crest   The bone block is delineated with the use of the saw and
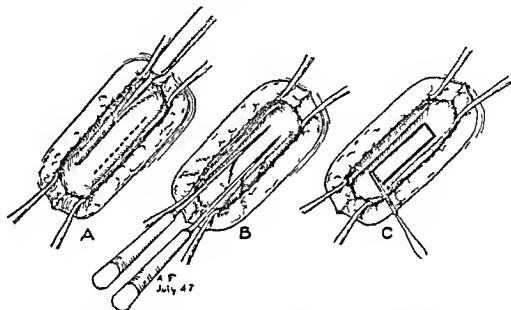
FIG 1 AUTHOR'S METHOD OF SECURING COMPOSITE BONE BLOCK
A, mapping of crest bone block, *B*, chisel convergence in block ostectomy, *C*, composite bone block freed for delivery

then the chisels cut and mobilize the bone block for removal   Figure 2 shows the composite bone block removed from its source, leaving a *wedge-shaped cavity* in the cortex and marrow of the iliac bone   Figures 2 *A* and II *B* show the appearance of a *composite bone block*   *C* represents the marrow cavity of the iliac bone packed with gelfoam and thrombin or fluffed oxycel gauze to control bleeding   Figure *D* represents the wound area in the process of being closed with chromic catgut #1 suture for the periosteum and muscle

THE NASAL PROCEDURE

The nasal procedure preliminaries are performed as for any other rhinoplastic technic, head and neck drapes and isolation of the operative field under the most rigid aseptic precautions   Figure 3 represents the method of packing the nose and nasal cavity preliminary to the surgical procedure and insertion of the bone graft   The writer utilizes this method of packing the nose whether general or local anesthesia is used   To secure the proper ischemia of the soft tissues

lining the cavity of the nose the packing is saturated in equal parts of cocaine 10% and adrenalin 1–1000 and wrung dry before insertion.
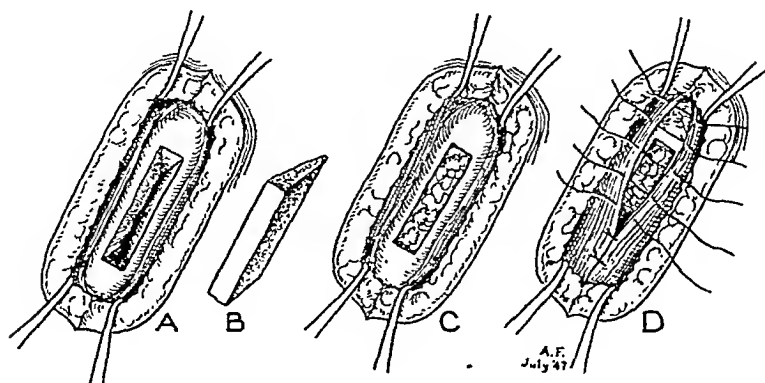
Fig. 2. *A*, marrow cavity exposed—confined by inner and outer table of ilium; *B*, composite bone block removed; *C*, marrow cavity packed with fluffed oxycel gauze or gelfoam and thrombin; *D*, chromic #1 suture of periosteum and muscle.
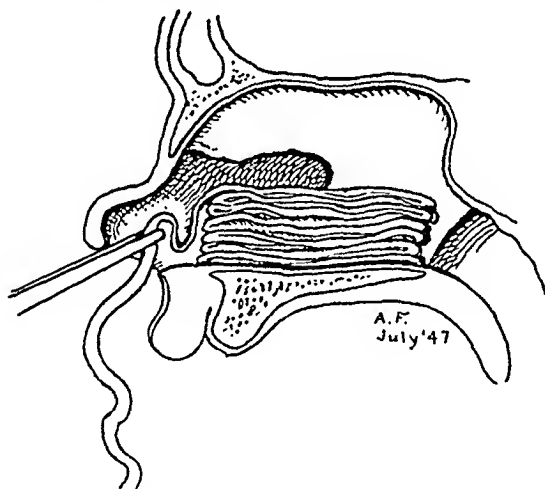
Fig. 3. Drawing to Show Author's Method of Packing Nasal Cavity

THE MUCOSAL FLAPS

It is not necessary that the roof of the mucosa occupy its apical position in the nasal bony fissure between the septum and the lateral and dorsal bony roof. (*In saddle noses, the mucosa formerly in the apical position occupies a horizontal plane.*) Further in rib reconstruction or in bone grafts much of the mucosa is allowed to remain in place by some surgeons. The author *mobilizes* the mucous membrane freely, however, and after repair *repositions* the mucous membrane *to the contiguous areas of the newly-implanted graft.*

X-RAY INTERPRETATION OF BONY AND CARTILAGINOUS PATHOLOGY

Together with a study of x-rays and a clinical examination, the structural defects in the nose, both the bony nose and cartilaginous nose, can be ascertained before coming to the operating room. Figure 4 represents a schematic drawing showing the atrophy of both the upper lateral cartilage, and the lower or alar cartilage in a typical case of saddle nose following abscess destruction of the septum.

Case No. 1. Pre-operative profile view of subject 15 years after destruction of septal cartilage by abscess.

SKELETONIZATION OF THE SUPPORTING STRUCTURES

While in most saddle noses there is an associated defect in the bony dorsum, the perpendicular plate, quadrilateral cartilage and the vomer, nevertheless, the writer deems it necessary to completely skeletonize the remaining supportive structures in order to do thorough corrective reconstructive procedures. Through a marginal incision in both nares, the subcutaneous tissues are completely elevated over the dorsum of the bony and septal region. This dissection is carried out further by a complete submucous elevation of the mucoperiosteum and perichondrial flap, completely exposing the interperichondrial space occupied by the former septal support. This skeletonization is carried out for the saddle

nose deformity just as it is carried out by the author's technic as explained else-
where in the *rhinoplastic technic procedure,* the only difference being that in the
saddle nose there exists a loss in supportive structure. Figure 5 demonstrates
the marginal incison as the first approach in the insertion of the bone graft.   *B*
represents the dissection being carried out subcutaneously and submucously.   *C*
represents the complete mobilization and skeletonization of the alar cartilages
and *D* the equalization of the alar cartilages or the transposition in cases where

Case No. I. Postoperative view of same patient 3½ years after reconstruction with com-
posite bone graft.

there is a deficiency.   Subperiosteal undermining over the bony dorsum is carried
out through the same marginal incision preparatory to insertion of the bone graft.

MODELING AND SHAPING OF THE DONOR BONE GRAFT

The bone graft is grasped, as demonstrated in figure 6 with an Asch forceps
and the periosteal attachment smoothed and pared off with the use of a chisel.
B represents a lateral view of the modeled composite bone graft after chiselling
and sawing to the desired proportion.   *C* represents a dorsal view of the modeled
bone graft.   It should be noted that the dorsal view represents a tapered graft
as the *proximal and distal* end to accommodate for the narrowing at the root of
the nose and at the tip of the nose.   In *B bevelling* of the cortical portion of the

graft can be visualized to harmonize with the position it occupies between the lateral nasal bones. In the lower position, the cancellous portion of the graft appears as a rudder of the common sailboat. Finally, a chisel is inserted subperiosteally for the removal of a section of dorsal nasal bone to permit for *bone rest* of the upper portion of the graft, *subperiosteally*, then, the completed bone graft
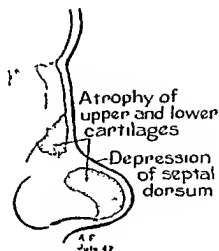
FIG. 4. Schematic Drawing of Saddle Nose after Abscess, Trauma, or Surgery
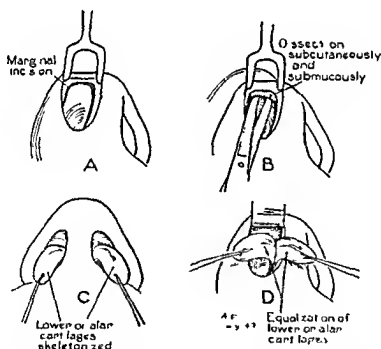
FIG 5 Endonasal Approach in Preparation of Recipient Site for Bone Graft

is grasped with thumb forceps and inserted through the marginal incision as demonstrated by figure 7

INSERTION OF THE BONE GRAFT AFTER THE PREPARATION OF THE BONE REST OF THE BONY NASAL BRIDGE

A *trial insertion* of the bone graft is made before complete finishing of the graft is done. This trial insertion will give some clue as to the exact *applicability* of the graft with neighboring structures. The author's technic calls for a

bone graft completely surrounded in the septal region by the perichondrium, its dorsal portion resting on the lateral nasal bones as well as the root of the nose subperiosteally. Figure 8 represents the appearance, somewhat schematic, of the bone graft in its site after insertion, its most inferior extension of cancellous bone resting just behind the most anterior portion of the anterior spine of the maxilla. Closure of the marginal wound in each naris is accomplished with interrupted sutures of 4–0 silk. The mucosal flaps are packed up lightly against the bone
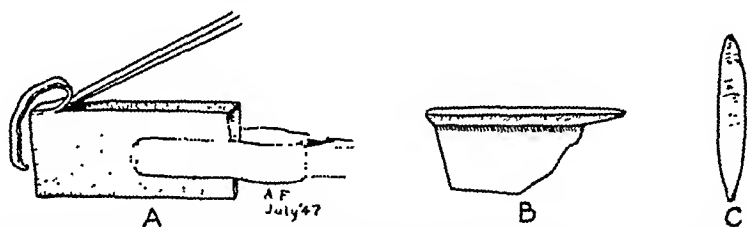
FIG. 6. *A*, paring of periosteum from bone graft block; *B*, lateral view of modeled composite bone graft; *C*, dorsal view of modeled graft.
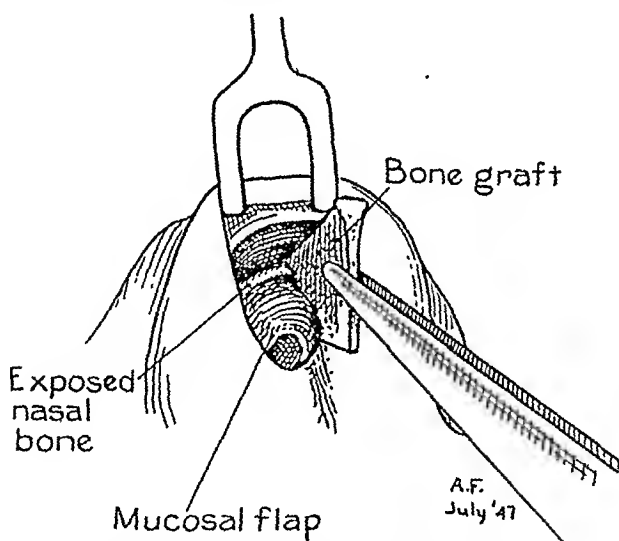
FIG. 7. INSERTION OF MODELED BONE GRAFT THROUGH MARGINAL INCISION
Proximal portion of graft fits on to bone rest

graft with xeroform packing extending as far back as the perpendicular plate of the ethmoid. Externally a lead form over dental stent over vaseline gauze is used to give the proper splinting postoperatively and this is held in place with adhesive strapping. The surgeon may elect to utilize the dental stent with or without the lead form or a metal form without the dental stent. It is advisable to leave the splinting of the nose and graft for a minimum of five days although anywhere from seven to ten days may be within normal limits. The sutures are removed from the sixth to the tenth day and general hygiene of the nose is given at

this time   In most cases where there has been no break in technic it will not be necessary to resort to the use of penicillin or sulfa drugs or any other form of chemotherapy   Penicillin may be given routinely, if desired

THE BONE GRAFT

The wedge shaped piece of bone removed has the following characteristics

The cortex forms the dorsal and part of the superior lateral nasal bony wall and lies on the superior surface of the nasal bones   In some cases of extensive loss of the nasal bones, both as part of the nasal bony dorsum and lateral nasal
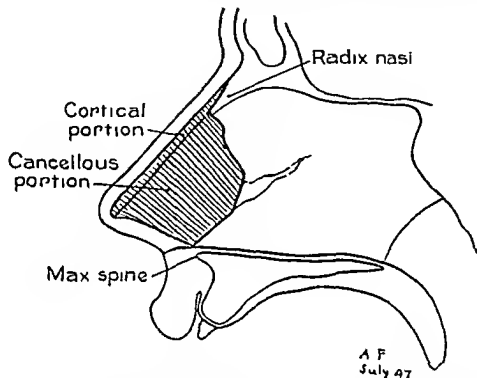
FIG 8 DRAWING TO REPRESENT APPEARANCE OF COMPOSITE BONE GRAFT AFTER INSERTION

bone, it is often possible to apply a composite graft of cortical and cancellous bone as an onlay as was done in one of the author's cases   This method is of value in war injuries where there is loss of bony substance   This is also of value in impacted fractures of the nasal bone that may be considered irreducible

The composite onlay graft presents an opportunity for early union in fractures of the nasal bones and maxillae where mobilization is difficult or wiring is necessary

RÉSUMÉ

The efficacy of bone grafts vs rib cartilage grafts in rhinoplastic reconstruction·
The bone graft is perhaps one of the most stable grafts to be utilized in the reconstruction of the saddle nose   *Its efficacy rests upon its stability, resistance and compatability with the bony and soft structures of the nose all favorable to a metaplasia*   It can be secured in large enough quantities, can be shaped and placed within the interperichondrial space to rest upon the nasal bones and vomer.   A

Case No I A Pre operative x ray of Case No I Left lateral view, showing saddling of the nasal dorsum
B Left lateral postoperative x ray 3½ years following author's reconstruction with composite bone graft Compare with E and with Fig 8
C Right lateral postoperative x ray 3½ years after author's reconstruction with composite bone graft
D Right lateral pre operative x ray showing saddling of the nasal dorsum.

Case No I E Photograph taken at time of operation showing appearance of completely modeled bone graft prior to insertion into recipient site

Case No III. Pre operative profile view of patient presenting saddling of nasal bone

Case No III. Postoperative view of patient 3 months after composite onlay bone graft

single block of cortical or composite bone from the ilium permits of greater latitude in the procurement of autogenous grafts, whereas, the use of costochondral carti-lage is often unsatisfactory due to greater difficulty in obtaining the graft.   Very often there is rapid absorption of the autogenous cartilage as well as the homo car-tilage.

Cartilage will not only be absorbed but will often change in shape.

The stability of dorsal cartilage grafts in saddle noses depends primarily upon fibrous tissue union about the cartilage rather than a union of the graft with the

Case No. II. Pre-operative view of patient who gave history of four previous operations within one year.   1, rhinoplasty; 2, submucous resection; 3, preserved cartilage implant; 4, preserved cartilage implant.

supporting structure of the nose.   The utilization of rib cartilage preserved is also *subject to absorption*.   On the other hand, a procedure in common practice today is the utilization of the bone graft from the rib itself when the rib has been resected in transthoracic procedures.   This procedure eliminates one operation on the subject.   However, the cancellous bone is not sufficient for the septal in-terperichondrial graft as is the case in the utilization of the cancellous graft from the ilium.   *One of the prime reasons for the efficacy of the bone graft in rhino-plasty is that the cortical portion of the graft can be placed on a seat at the radix nasi which is below the periosteal blanket.*   This grants for primary union and gives

better support to the nasal dorsum. In addition, the efficacy and position of the graft can be ascertained not only by feeling but by serial x-ray study from time

Case No. II. Photograph of specimens removed from Case No. II preliminary to reconstruction with composite bone graft. The specimen removed showed foreign body reaction and consisted primarily of fibrous tissue.

Case No. II. Postoperative view of same patient 10 months following composite bone graft.

to time. The method of securing rib cartilage grafts for reconstruction of the nose is adequate when a rib resector is utilized to strip the perichondrium and costochondral tissue from the cartilage. The use of the Kelly[2] cartilage gouge

has a tendency to compress the outer layer of cartilage cells and at the same time causes a curling of the cartilage which will eventually produce a deformity in the nose.

OBJECTION TO THE USE OF BONE GRAFTS

1. The risk of pressure with necrosis of the skin of the dorsum.

2. The graft must and should occupy the interperichondrial space as well as to exist as an onlay graft for the purposes of nutrition.

3. Not so with cartilage grafts, they can be simply onlay grafts with supporting columellar struts.

4. The placing of such graft in the interperichondrial space of the septum connotates diminished airway and therefore difficulty in breathing, *unless the graft is expertly tailored.*

5. Technical details in obtaining the graft as above described are too troublesome.

6. The tailoring of the graft itself to the proper proportions demanded in a specific recipient site becomes a variable; each case warrants individual attention.

7. The danger of absorption should it take place.

8. Consumption of time in obtaining graft comparable with no loss of time in the procuring of preserved grafts.

CONCLUSIONS

It has been shown[3] that cartilage warps and shifts and is absorbed and is more easily infected than bone. Bone is superior as a graft when support is needed. The influence of cadaver cartilage on the host is not fully known. The local disturbances are fibrous union, abscess formation, and softening with loss of tissue. Whether the graft or homocartilage will influence blood dyscrasias or metabolic disturbances remains to be proven.

The use of autogenous bone as graft material produces satisfactory results in saddle nose reconstruction when the graft is properly tailored. The possibility of a change in appearance after correction is minimized as compared to cartilage graft. The bone graft dove-tailed between the nasal bones and on the radix nasi is part of the supporting structure subsequent to metaplasia. The soft tissue covering of the dorsum of the nose is a uniform blanket of skin and subcutaneous tissue and periosteum which will neither shrink nor shrivel, or produce displacement of the graft. The presence of a full thickness soft tissue dorsum allows for a more natural appearing nose than is possible with cartilage grafts. In the use of cartilage grafts, the technique is primarily limited to the use of onlay grafts in the subcutaneous tissue. In the writer's experience such grafts frequently become conspicuously outlined due to a fibrous union contracture about the graft. The resulting distortion often produces curling or graft displacement. This in itself may excite absorption. The viability of cartilage grafts is explained on the basis of lymph drainage or foreign body reaction and encapsulation; that of bone on the basis of metaplasia which implies blood circulation. The tendency to introduce cartilage grafts in tunnelled subcutaneous pockets often results in un-

Case No IV A Front view photograph pre operative of 16 year old girl presenting saddling of the nasal dorsum due to staphylococcus septal abscess at age of 10

Case No IV B Front view postoperative photograph of the same patient 15 months after composite bone graft reconstruction

Case No. IV. C. Profile view pre-operative showing saddling of the septal dorsum and lack of development of the bony dorsum.

Case No. IV. D. Profile view postoperative 15 months after composite bone graft reconstruction.

controllable and subsequent hematoma, which finally break down and cause cartilage absorption or extrusion. The author's technique in bone graft reconstruction of the saddle nose is not accompanied by such dangers.

The value of pre- and postoperative x-ray interpretation serves adequately to determine the position and fusion of the bone graft. With the use of serial x-rays at intervals of six months, viability and other bone characteristics of the graft can be fully appreciated. In consideration of the optimum age for the use of bone grafts, the writer emphasizes their wide use from the age of puberty to the fifth decade. In the older age groups (after 50) the existence of
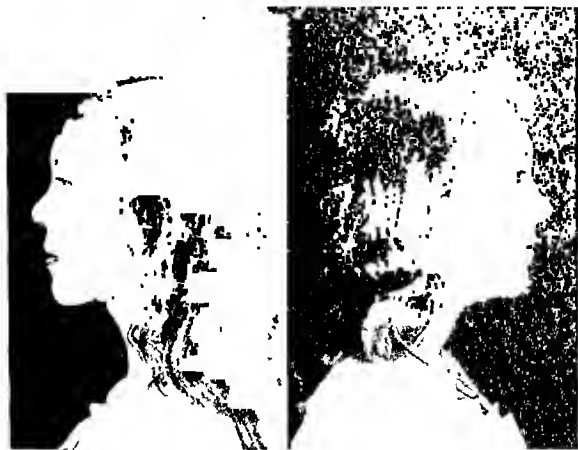
Case No. IV. E. Profile view of patient postoperative taken with twin sister in the same relative position.

softness or unusual sponginess of cancellous bone connotes a poor prognosis in regards to bony union and success of the graft. Comparatively with respect to cartilage grafts, *the chief factor designating priority for the use of bone grafts is the requisite for stabilization, the latter is predicated upon bony union in the host area.* It is because of this fact and in conjunction with the *mechanical tailoring* of the graft that more uniform draping of the nasal contour establishes improved *functional and cosmetic results.* Analogous to this situation is the technique employed by the author in securing the bone block graft. The simplicity of removing a uniform wedge of bone from the host area eliminates fifty per cent of the requisite mechanical modeling of the bone graft which is generally required in reshaping the crude bone block obtained from the crest. Similarly, less difficulty is ex-

perienced in removing the wedge bone block designated by the writer than is the case with bone grafts removed from the inner table of the ilium.   Specifically the inner table grafts are concave consisting primarily of cortical bone; they are difficult to shape and lack uniformity in distribution as a composite graft.   Because of this factor, dislocation of the graft often takes place with subsequent loss by absorption.

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FAT SUBSTITUTES IN CHEEK DEFORMITIES   I

LEONARD R. RUBIN*

The problem of substituting a fat stimulating material for soft tissue defects of the face has not been solved In the past, we have used autogenous fat, derma and fascia lata for such defects Unfortunately, an undeterminable degree of absorption occurs, leaving the result of the operation in doubt To compensate for the absorption, it has been customary to stuff the defect, hoping that by such overcompensation, enough material would escape absorption to fulfill the need If the deformity was bilateral the end result was very poor, since facial symmetry was impossible to achieve

All sorts of foreign substances have been tried, from paraffin in the old days to vitalhum and tantalum in recent years

The dangers of paraffin are well known, of course Metals are hard and rigid To be used they have to be anchored to a bony support and at best cannot be used A case reported by Mills has served to illustrate this point

To help solve this problem, all soft and elastic plastics were investigated Sponge latex rubbers were eliminated because of tissue intolerance This is primarily due to the chemicals used in curing the rubber The soft plastics, known as vinyl acetates were then checked It was found that the elastic quality imparted to the plastic was given to it by "plasticisers", chemicals highly irritable to body tissue if implanted

The next group of plastics investigated were the polymers of polyethylene In a recent paper published by the author, the value of polyethylene in reconstructive surgery has been discussed However, in consideration of soft tissue defects, it was found that whereas the polyethylene is resilient, it doesn't have sufficient elasticity and softness to be used for soft tissue defects

Polyethylene sponge was made by heating fine granules on a slab of plaster of Paris Air bubbled through the mass, sponging it However, although greater elasticity was obtained, it still felt too hard

The last type of polyethylene used, polyethylene "hair", will be described in the second part of this paper

Fiberglas in form of soft wool seemed to offer great promise In the hand, it is softer than the finest Cashmere wool We implanted some of this material in a patient's abdomen We noted that after a few days, fluid accumulated about the implant We also noted that the mass of Fiberglas packed down so that after several months, the implant felt hard and nodular The fluid absorbed, but the hardness and loss of elasticity made the material useless for cheek implants

At the time of my investigations with polyethylene, an artificial rubber plastic known as polyisobutelene or, in the trade, as Vistenex, offered a new hope for a fat substitute Examination of literature put out by the Standard Oil Company,

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the manufacturer, disclosed that this polyisobutelene contained no plasticisors which would be irritable. Various commercial tests by Dr. George K. Higgins of the New York Medical College, such as patch tests on human skin and feedings pieces and washings to animals, showed the material to be generally non-toxic. A few tiny pieces implanted in animal abdominal tissue for a period of three months were found to be non-irritating. With these modalities, it was felt by the author that the material might be suitable as a fat substitute for soft tissue defects.

Physically, polyisobutelene feels like a sponge rubber ball. Coming from the factory, it is amber color, somewhat sticky and filled with vacuoles of air. It is manufactured in several viscosities. The type used in our work was of sufficient firmness to hold form when shaped. The material is cut with great difficulty by knife. It can be ground with a dental stone and it can be compressed by great pressure. However, fine modeling is impossible because of "drifting" or gradual loss of shape. The type used contained no inhibitors or other impure chemicals.

The qualities described seemed to be adequate to fill the defects in the face where sharp modeling wasn't needed. Such defects presented itself in a case of lipoid dystrophy of the face. The case report will serve to describe how polyisobutelene reacted in the body tissues.

The patient, a twenty-four old white female was referred to me by Dr. Meyer A. Rabinowitz of Brooklyn, New York, with a diagnosis of lipoid dystrophy of the neck and face. He had followed the disease for twelve years. It was characterized by gradual loss of subcutaneous tissue and fat from her neck and face. Her face became gaunt and haggard. In the attempt to improve her facial appearance, she ate large amounts of food, gaining and storing weight on all parts of her body but her face and neck. The disease was slow in progressing. Normal puberty occurred. There have been no further facial changes for the past few years.

Physical examination showed a white female whose face and neck looked emaciated (see photo, fig. 1a, b, c). Below her clavicles, her body could be called plump. Her facial and neck muscles stood out as tense cords. Almost all subcutaneous fat was missing from between the muscles and skin. Buccal pads were absent, giving a cadaverish appearance. Muscular action was good with normal smiling.

In considering the correction of the facial cadaverish appearance, it was apparent that by replacing buccal fat or equivalent, it would be possible to round out her cheeks. Since the deformity was bilateral, fat, derma or fascia lata grafts could not be used (because of irregular absorption). Polyisobutelene seemed to be the material of choice.

First a facial cast was made. The problem of size and shape for the fill was considered. The effect of the insert upon the smiling mechanism was indeterminable beforehand. Two pieces were shaped to fill the cheek depths. This was done by grinding with a dental stone (see fig. 2). In November, 1947, pockets were made in abdominal fat and each piece was buried. In addition, six other small pieces were buried in separate pockets. Post-operatively, the six small
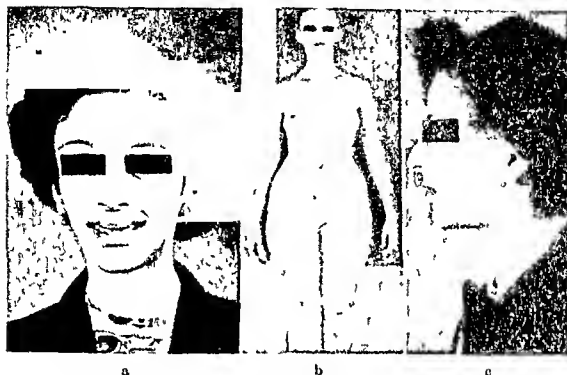
Fig 1a Pre operative Full face View of Patient
Fig 1b Pre operative Body View
Note the plump body and emaciated neck and face
Fig 1c. Pre operative Profile

Fig. 2a, b. Photographs 9 Months Post-operative
Note unobstructed smile

pieces showed no reaction at all. Not so with the large pieces. One had a little fluid accumulated between the piece and the skin. This was evacuated by needle and pressure dressings were applied. The other piece needed two evacuations of

FIG. 3a. POLYISOBUTELENE IMPLANT USED FOR EACH CHEEK
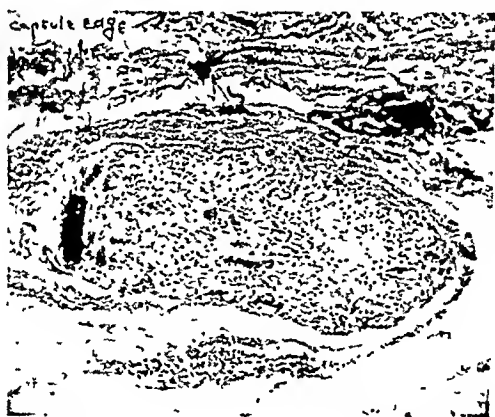
FIG. 3b. MICROSCOPIC SECTION (MAGNIFICATION 100×) OF WALL SURROUNDING A POLYISOBUTELENE PIECE IMPLANTED IN ABDOMINAL WALL NINE MONTHS PREVIOUSLY

There has been a moderate encapsulation of the piece. Photograph is concentrated at a group of giant cells which was present in the slide. This is done to show the structure of the foreign body reaction. Since there were few groups of giant cells and since the polyisobutelene is well tolerated, the general reaction was no more than what would be found with a piece of silk.

a bloody serous fluid before it became quiescent. In seeking an explanation for the fluid, one possibility was considered. The six small pieces had had no reaction at all. They were cut directly from the block which came from the factory. The large cheek pieces were cut and then ground to shape with a dental grinding stone. It was easily possible that some pumice adherent to the stone could have contaminated the polyisobutelene and so caused an irritation.

On the 26th of December, 1947, the patient was taken to the operating room The abdominal pouches were opened The polyisobutelene was exposed Each lay in a fibrous envelope There was no ingrowth or adhesion of fibrous tissue to the pieces When inserted into the abdomen, the pieces had been roughened so as to allow adhesion to fibrous tissue (this was routinely done with polyethylene). Now they were smooth Thin edges were curled in

A pocket was made in each cheek by cutting an incision in the infraorbital region along facial lines The skin was lifted from the underlying muscle Very little subcutaneous tissue was seen To facilitate dissection novocaine was injected throughout the planned area Medially, the pocket extended in the naso-labial folds The pieces were placed in position They were not sutured The wounds were closed carefully Pressure dressings were applied

The immediate post-operative course was somewhat disappointing Fluid appeared in each cheek about the third day One side was aspirated on the sixth day with 2 cc of bloody serous fluid being obtained This was repeated two more times The other cheek was aspirated just once

Following this early period, fluid gradually absorbed At first the cheek pads seemed to be too large However, when all the fluid disappeared, the size was just right There was no distortion in smiling The thin lateral edges which were made to blend into the rest of the face appeared to have curled somewhat, losing the ideal shading off of the implant into the surrounding tissue (see fig 3a)

DISCUSSION

The use of fat, derma or fascia lata as soft tissue grafts have had their limitation because of irregular absorption In bilateral defects, the resultant asymmetry ruled them out entirely The soft plastics as the vinyl-acetates could not be used because of the irritating "plasticisers" which kept the plastic soft The polyisobutelene used in this case described, has given a good cosmetic result Study of a section of tissue taken from the capsule a piece of polyisobutelene implanted nine months before in the abdominal wall showed some foreign body reaction This section (see fig 3b) demonstrates fibrous tissue and foreign body cells However, the reaction is no greater than would be encountered with silk.

In the face and the abdomen, the plastic shows no clinical reaction at all

CONCLUSION

Polyisobutelene, an artificial rubber is presented as a substitute for fat in soft tissue defects It is not as soft as fat, but it is well tolerated by the body and can be placed in cheeks with no disturbance of the smiling mechanism The body reaction to it is no greater than it would be to any inert foreign material as silk or nylon.

FAT SUBSTITUTES IN CHEEK DEFORMITIES. II

DR. DAVID TEPLITSKY AND DR. LEONARD R. RUBIN*

The success of polyethylene in facial reconstruction has given us a non-irritating foreign material for implantation. In Part I the author has described how he tried to "sponge" polyethylene by passing bubbles of air through a mass of heated plastic. Unfortunately, this type of polyethylene was still too hard to act as a fat substitute.

The senior author in this part of the paper suggested that polyethylene might be tooled on a machine to produce strings or 'hair'. A mass of this hair feels just like a mass of horsehair. It is resilient, compressible, light and conceivably could be used as a fat substitute. With this in mind a mass was buried in a patient's abdominal fat.
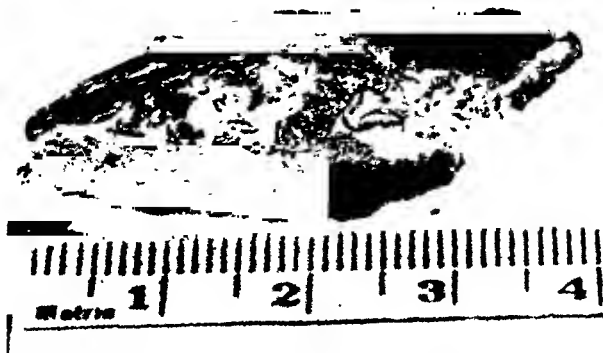
FIG. 1. SECTION OF SKIN AND SUBCUTANEOUS TISSUE IN WHICH SHAVINGS (POLYETHYLENE HAIR) WERE BURIED

This section is six months post-burial. Note how the edges of the "hair" are enveloped in fibrous tissue.

The post-operative reaction was very slight. There appeared to be some fluid present which absorbed within two weeks. There was a fibrous reaction which gradually subsided, leaving a mass of "hair" which could be squeezed and pinched, only to return to its rounded shape. The mass seemed to retain its resilience and compressability.

Six months later, there was no clinical signs of any reaction. The abdominal area was cut through and a section was removed. This section took skin, subcutaneous tissue, fat, polyethylene "hair" and fat (see fig. 1).

Microscopic study showed a moderate foreign body reaction not unlike silk

or any other inert material. There were giant cells amongst the fibrous tissue cells (see fig. 2).

FIG. 2. THIS MICRO-SECTION (MAGNIFIED 100 ×) IS AN EDGE SHOWING THE FIBROUS REACTION AND ROUND CELL INFILTRATION ABOUT EACH POLYTHYLENE "HAIR" STRAND. HOWEVER, CLINICALLY, NO REACTION IS NOTED AT THIS TIME

DISCUSSION

The "Hair" has been used in three cases. One was a slight depression in a nose. Several strands of hair inserted under the skin through a columella incision corrected the depression with no reaction. A second case had some strands inserted over an old depressed malar region which had had several attempts at repair with cartilage, only to have resulting absorption. The result in this case was disappointing. Apparently an infection followed the insertion. Drainage persisted for several months. Finally, the strands were removed. The wound closed promptly.

The third case was a small depression in the supra-orbital region. This was inserted with no reaction and an excellent cosmetic result was obtained.

CONCLUSIONS

Polyethylene, a synthetic plastic, which has been previously described as an excellent substitute for cartilage and bone, is now being offered in a new form as a substitute for soft fatty tissue. It has some limitations, but to date, is the most resilient, compressible and moderately non-reactive substitute offered for soft tissue defects in facial reconstruction.

HEMIHYPERTROPHY OF THE FACE*

Case Report

LEON E. SUTTON, M.D.

From Department of Surgery, Division of Plastic Surgery, Syracuse University, College of Medicine, Syracuse, New York.

Hemihypertrophy or hyperplastic enlargement of one side of the body is less frequently seen than hemiatrophy. Partial hemihypertrophy, involving one extremity or one or more digits is not too uncommon even after enlargement due to known causes, such as lymphangioma, has been eliminated. Localized hemihypertrophy of the face, however, is somewhat of a rarity. In most of the reported cases enlargement is limited to the mandible.

The present report has to do with an instance of enlargement of the upper part of one side of the face in a boy of six months. Updegraff (1), in 1930, reported a case of congenital hypertrophy of the maxillary region in a young man of twenty one years. His patient had a negative family history. The left side of the face showed progressive enlargement to about twelve years of age. The left side of the lips and left cheek were enlarged and the left angle of the mouth pulled downward. The eye and nose were normal but the ear was enlarged. The left half of the tongue was somewhat enlarged but the mandible was not involved, neither were the zygoma nor the orbit. There were no sensory or motor changes. Blood chemistry was normal. A pigmented nevus covered part of the left cheek. Treatment consisted in excision of excess fatty tissue and some bone. There was some recurrence of fatty deposit but none of bony growth.

Updegraff found in the literature prior to 1930 about twenty five cases of congenital unilateral progressive hypertrophy of the face with enough similar points to render this condition a "text book entity". He particularly mentioned a case reported by Werner (2) in 1904 which paralleled his case in every detail even to the presence of a nevus in the enlarged cheek. In Werner's case, however, the mandible and tonsil were also enlarged. A review of the literature since Updegraff's case was reported in 1930 discloses several cases (3, 4, 5, 6) of hemihypertrophy of the face but none exactly similar to the present case.

My patient (fig. 1) was a boy six months old when I first saw him in 1943. He was apparently normal in every respect except for the left side of the face which was malformed. The left cheek was enlarged from the zygoma downward. The left side of the upper and lower lips were very thick and the left angle of the mouth was pulled downward as if by the weight of the pendulous cheek. The nose, region of the eye, and the ear, were apparently normal. The maxilla did not at that time appear to be enlarged and this observation was confirmed by x-ray examination. A biopsy taken from the middle of the cheek (fig. 2) showed normal fat.

The family history was negative. The mother had no illness during or just before pregnancy and the delivery was normal, without instruments. No systemic dyscrasias of any kind were found in careful general studies. This child had no nevus such as reported by Werner and also by Updegraff. Enlargement of the left upper alveolus and palate (fig. 3) was first noticed at about one year. This has been progressive. The first teeth on this side of the maxilla came early and decayed rapidly. Recent x-ray examination (fig. 4) shows enlargement of the left maxilla, most marked in the region of the alveolus and palate with no evidence of increased or decreased density. This boy has one brother, a year younger, who is normal.

FIG. 1   FIG. 2

FIG. 1. HEMIHYPERTROPHY OF THE FACE AT SIX MONTHS OF AGE, BEFORE TREATMENT
FIG. 2. BIOPSY FROM MIDDLE OF CHEEK SHOWED NORMAL FAT

Several operations have been done on this boy in the past five years in an attempt to control the apparently progressive enlargement of the left cheek and lips (fig. 5). These operations have consisted of excision of superficial fat, ligation of the external maxillary artery, reduction of thickness of the lips, and elevation of the left angle of the mouth by insertion of a naso-labial flap beneath it. Muscle has been removed only in reduction of the lips. Microscopically (fig. 6) the muscle shows fatty infiltration but no definite or consistent hypertrophy of the muscle fibers themselves. Sensation and muscle power in the involved cheek are apparently unimpaired. Careful examination during several admissions to the hospital have revealed no other abnormalities.

Hyperplastic enlargement is apparently much more common in the mandible than in the maxilla (6). The reason for this is not evident. It is worthy of note, however, that the growth mechanism of the maxillary part of the face is entirely different from that of the mandible. Growth of the maxilla proceeds from the suture lines where it is initiated by proliferation of connective tissue. In the

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FIG. 3. ENLARGEMENT OF THE LEFT MAXILLA AND ALVEOLUS FIRST NOTICED AT ONE YEAR

FIG, 4. X-RAY TAKEN AT FIVE YEARS OF AGE SHOWS ENLARGEMENT OF THE LEFT ANTRUM AND ALVEOLUS

mandible, the main growth center is the hyaline cartilage of the condyle. In other words, the chief growth factor in the mandible is proliferation of hyaline cartilage and in the maxilla, connective tissue.

Growth and development of the upper part of the face is determined by enlargement and shift of the maxillary complex (7) (maxilla and palate bones).

FIG. 5 PRESENT CONDITION AT SIX YEARS OF AGE
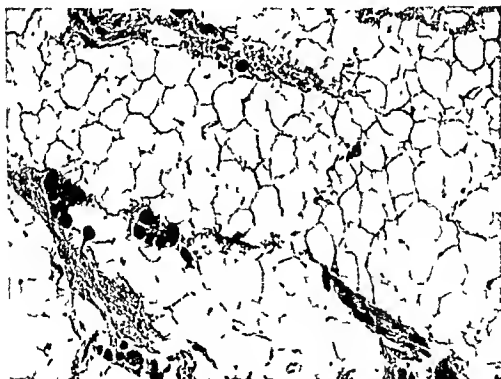
FIG 6 BIOPSY FROM THE UPPER LIP SHOWS FATTY INFILTRATION BUT NO HYPERTROPHY OF THE MUSCLE

The most important sites of growth of the maxillary complex are three sutures (fig 7): The frontomaxillary suture, between the frontal bone and the frontal process of the maxilla, the zygomaticomaxillary suture, between the maxilla and

the zygomatic bone; and the pterygopalatine suture, between the pterygoid process of the sphenoid bone and the pyramidal process of the palatine bone. These three sutures are parallel to each other and all directed from above and anteriorly downward and posteriorly. Growth in these sutures will tend to shift the maxillary complex downward and anteriorly. In the present case the most apparent maxillary enlargement is in a downward and forward direction.

It might be suggested that some endocrine imbalance in the mother or new born may play a part in hemihypertrophy of the face. The endocrine glands which are known to influence bones are: The pituitary, thyroid, gonads and parathyroids. The thyroid stimulates differentiation of eosinophilic cells of the

Fronto-
maxillary
suture

Zygomatico-
temporal
suture

Zygomatico-
maxillary
suture

Pterygo-
palatine
suture
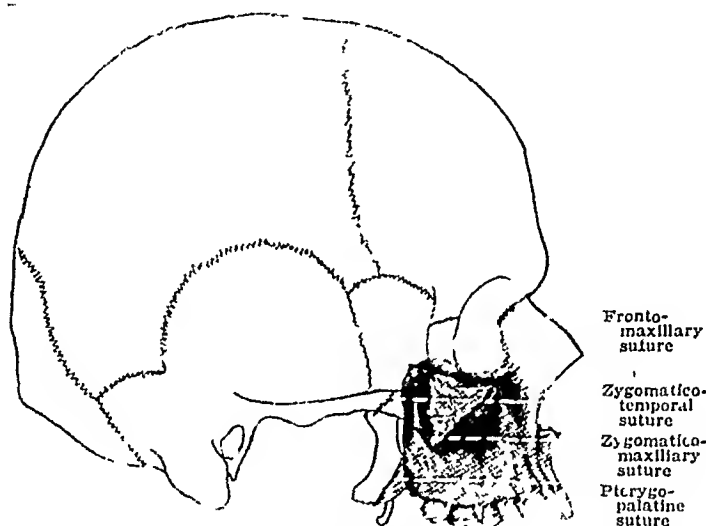
FIG. 7. THE MOST IMPORTANT GROWTH SITES OF THE MAXILLARY COMPLEX ARE AT THE SUTURELINES

pituitary which produce the growth hormone. However, giantism, or hyper-pituitarism of adolescence, usually produces the greatest growth in the mandible rather than in the maxilla and is nearly always bilateral. Castrated individuals show overgrowth of the facial skeleton and hypergonadism causes accelerated growth and maturation of the bones. Parathormone raises the calcium blood level but it does so by causing osteoclastic resorption of bone, increasing the excretion of phosphorus, and inhibiting the calcification of newly formed bone. In hypoparathyroidism osteosclerosis may result from decreased resorption and increased apposition of bone. The kidneys resorb more phosphorus than normally and the phosphorus blood level rises. Surplus phosphorus combines with calcium and is deposited as newly produced bone or metastatic calcifications. In the neonatal type the mother does not get enough calcium in her diet causing the parathyroids to hypertrophy in an effort to obtain more calcium from the skeleton. The fetus then gets too much parathormone and development of its

own parathyroids is arrested. This condition, with the associated tetany, usually returns to normal soon after birth as the parathyroids develop.

The only vitamines whose effect on the skeleton has been determined are A, B complex, C and D. Deficiency of Vitamin A retards endochrondral bone growth and growth of the alveolar process is slowed. Proliferation of sutural connective tissue is affected very late. Deficiency of B_2 produces congenital skeletal malformations in the rat but these consist for the most part of absence or shortening of bones. Deficiency of the filtrate factor of nicotinic acid leads to osteoporosis of the maxilla. In scurvy, due to Vitamin C deficiency, bone growth is inhibited, resulting in osteoporosis. Lack of Vitamin D produces rickets in the infant and osteomalacia in the adult. New borns in the first month of life are rarely affected, the fetus being protected at expense of the mother. Excess of Vitamin D may cause extensive damage to the skeleton, kidneys and blood vessels and produce osteitis fibrosa cystica. Osteo sclerosis is seen only in the later stages

As far as the minerals are concerned, clinical and experimental deficiencies or excess of calcium, phosphorus or fluorine have not produced selective bone hyperplasia. In the case under discussion there is no history or clinical evidence of injury, inflammation or tumor (8).

<div align="center">COMMENT</div>

There seems to be little evidence to suggest that deficiency or excess of the endocrines, vitamines or minerals are responsible for hemihypertrophy of the face. There was nothing abnormal about the pre or post natal history of this child. The possibility of a neurogenic factor has not been discussed because of the absence of other signs which should accompany such a condition. Until further evidence is offered it would seem that a defect of the germ plasm (9, 10) is the best explanation of this type of congenital defect.

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A MORTISED MANDIBULAR BONE GRAFT FOLLOWING GIANT CELL TUMOR REMOVAL

A TWENTY-FIVE YEAR HISTORY*

CLAIRE L. STRAITH, M.D.

Detroit

The giant cell tumor, or osteoelastoma, is a locally destructive process which may be invasive but does not metastasize and seldom kills the patient. It usually occurs in children and young adults, nearly always before the age of thirty. In a thirty-five year period at Johns Hopkins Hospital only 22 cases were found involving the bones of the head, of which fourteen involved the mandible. Of 1000 bone tumors reported by Christensen, 20 were of the maxilla and 21 of the mandible. Of all eases of giant eell tumors registered with the American College of Surgeons, the maxilla and mandible were involved in 9% · and were involved about equally in number.

It occurs most often at the ends of the long bones, either in the metaphysis or epiphysis, but may occur in any bone developed in cartilage. The center of the bone is expanded and the cortex often reduced to a thin shell so that a spontaneous fracture or collapse of a joint surface not uncommonly calls attention to the lesion. In the mandible the tumor occurs in those portions derived from cartilage—either in the symphysis or in the ramus where there is a separate center of ossification. Frequently a tooth becomes loosened for unexplained reasons, the teeth become separated or displaced, or the tumor mass itself becomes apparent by lateral enlargement of the mandible. If a tooth is pulled, a granulating area may result which bleeds easily. There is seldom pain.

X-ray examination reveals a characteristic rarefied, multicystic, or trabeculated appearance as if the mass is composed of bubbles. There is thinning of the cortex, an absence of periosteal elevation, and sharp delineation from the surrounding bone and soft tissue. An adamantinoma (ameloblastoma) is most difficult to differentiate by x-ray.

Its etiology is in dispute. It has often been attributed to injury, and Codman believes it arises out of repair following hemorrhage. However, Ewing believes this is improbable. Geschikter and Copeland believe it is a transition process in the formation of permanent bone. They call attention to the fact that in the formation of normal bone canalization and vascularization are followed by removal of ealcified eartilage by osteoclasts, round cells and spindle cells as are found in the giant cell tumor.

The gross appearance is that of a soft, dark red, hemorrhagic mass, sometimes exhibiting yellow areas. It has a thin fibrous capsule. Microscopically there are three types of cells, round cells, spindle cells, and characteristic giant cells. 25 to 30 of these giant cells are usually seen per low power field. There are

numerous (15 to 200) small nuclei grouped in the center of the cell and not around the periphery as in the foreign body type giant cell

Treatment has been conservative since Bloodgood emphasized their benign character in 1910 and in 1919 reported 47 cases treated by curettage without recurrence   Within the last two decades x ray radiation has become a valuable adjunct in treatment and the preferred method of treatment in many cases Of 105 cases treated by curettage alone at Johns Hopkins Hospital, 31 recurred and 16 of these were cured by second and third emtettments   Their authors state that a 20% recurrence rate is to be expected by treatment by curettage alone, and that the probability of cure apparently is not in direct proportion to the completeness of the curettement   Thus curettement and x ray or x ray alone would seem the method of choice   The amount of radiation is not considerable, and it is preferable to administer small series of treatments at infrequent intervals (months or years)   Regression of the tumor is slow, and because of this, the uninformed may consider it radioresistant

As to prognosis, the mortality rate at Johns Hopkins Hospital has been less than 1% from the tumors and their treatment

The Case herein reported is of special interest for several reasons, namely the following

1 A definite history of an injury as a causative factor

2 X ray treatment had no apparent affect on the growth of the tumor

3 X ray radiation before surgery and x ray radiation and radium implants after removal of the tumor did not damage the bone cells sufficiently to prevent a complete take of the bone graft

4 The bone graft technique herein described and illustrated, though not original with the author, has not been published before in this country so far as the author has been able to discover.

CASE REPORT

Miss M H was a 16 year old white female first seen in this Clinic on August 6 1923 Six months previous to this (2/15/23) while playing basketball she fell, striking the left side of her jaw on a sharp iron post   Three days later she noticed that the region of the angle of her jaw was swollen though neither red nor tender   Following that swelling persisted and gradually increased in size   It was never painful, tender, red or ulcerated   However, about one month after the onset her dentist incised the swelling behind the last molar tooth with evacuation of only a small amount of bloody fluid   This was repeated three times with no better results   The second molar meanwhile had become loosened and was extracted   She was then referred to a roentgenologist who gave her deep x ray therapy (amount unknown) and diathermy   There was no apparent improvement

Physical examination revealed a well nourished and well developed white female of 16 years in no pain   The general physical examination including the lungs, liver, lymph nodes and long bones was normal

The jaw revealed a firm fixed non tender mass of hen egg size at the angle of the left jaw   The overlying skin was of normal color and texture and was freely moveable over the mass, which was fixed to the mandible

There was no ulceration of the mucous membrane of the mouth no caries and no pyorrhea There were no enlarged cervical nodes   The jaw function was neither impared nor painful

The laboratory data was essentially normal. X-ray studies revealed a marked decrease in density of the mandible involving the angle, part of the ramus and part of the body (fig. 1, No. 1). There were trabeculations which give it a vacuolated appearance. The diameter of the bone was about twice the normal and the cortex was reduced to but a thin shell except for ⅛ inch thickness at the lower border.

Operation No. I (8-9-23): Under gas ether anesthesia a mucoperiosteal flap was raised from the buccal aspect of the alveolar portion of the mandible. The bony cortex appeared thin and bluish and through several small openings in the cortex protruded a soft bluish membrane. The thin outer shell of bone was removed for a distance of 6 to 8 cms. revealing

FIG. 1. No. 1—X-Rays taken at the first visit reveals the multicystic appearance of the tumor.

No. 2—X-Ray three years after removal of giant cell tumor reveals pathological fracture of mandible and non-union.

No. 3—Appearance a few months after grafting bone from the ilium.

No. 4—Present appearance of the bone graft 20 years after insertion.

a bluish, highly vascular, friable mass the size of a hen egg. This mass was shelled out almost in toto and the bony cavity was curetted out. This left only a thin medial wall and lower border to support the mandible. The inferior dental artery was ligated and the cavity was packed with vaseline and iodoform gauze.

Pathological examination revealed the tissue to be a giant cell tumor.

On 8-13-23, 90 mgm. of radium was inserted in the bony cavity and allowed to remain for 15 hours. On 8-15-23 80% of 1 skin erythema dose of x-ray radiation was administered to the left lower jaw at 200 KV with 1 mm. Cu and 1 mm. Al filter. On 8-17-23, 95% of 1 skin erythema dose was administered over the right lower jaw.

The post-operative course was uneventful for about one month, at which time she sustained a pathologic fracture through the angle of the mandible. Following this the bone failed to unite, and the posterior fragment was pulled inward and forward. This left a slight depression at the angle of the jaw and caused a slight malocclusion. Otherwise the

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FIG. 2

follow up was essentially negative. The mass did not recur, nor did any nodes or other evidence of spread or metastasis appear.

On 11–2–27 the patient was readmitted to the hospital, where physical examination was normal except for a depression of the left side of the face over the ramus and angle of the jaw and a malocclusion. X-ray examination revealed the bony defect of the mandible, an absence of bone regeneration, and non-union (fibrous only) of the fragments (fig. 1, No. 2).

Operation No 2 Bone graft of the mandible (11-3-27) Under gas ether anesthesia a 4 inch curved incision was made from below the left ear around the angle of the mandible to the bicuspid region The anterior and posterior bone fragments were exposed and the posterior (upper) fragment was freed enough to allow it to be retracted into its original (normal) position Then the fragments were mortised and prepared for reception of a bone graft (fig 2 No 1 2 3 4 5) With the upper fragment held back in normal position a lead pattern was then cut in the proper dimensions and drill holes made through each end Corresponding holes were made in each mandibular fragment #22 silver wires were then inserted from within outward (fig 2 No 6 7) A four inch incision was then made over the crest of the left ilium and the bone exposed The lead pattern grasped by the lower border, was inverted and placed over the lateral aspect of the iliac crest—the curve of the plate and of the iliac crest matching nicely Drill holes were made through the holes of the plate into the bony cortex and markings were made in the periosteum around the lead plate Then with a saw and chisel a piece of bone half the thickness of the ilium and of

FIG 3 PHOTOGRAPH OF PATIENT 20 YEARS AFTER BONE GRAFT AND SHOWING HER RIGHT JAW FOR COMPARISON

the correct dimensions was removed (fig 2 No 8 9 10 11) This curved bony fragment was about 3 inches long, ½ inches wide and ⅓ inch thick The wound over the ilium was then closed about a soft rubber drain

The bone graft was then transferred to the mandible by rotating 90° in a clockwise direction so that the anterior end was transferred to the upper mandibular fragment The previously placed silver wires were passed through the drill holes and the mortized graft wired in place (fig 2 No 12) The wound was closed in layers

The jaws were then fixed in proper occlusion by locking together the cast metal upper and lower splints (these were cemented to the teeth in the office before her admission to the hospital)

X rays on 11-4-27 (fig 1 No 3) revealed the bone graft to be wired in proper position and extending from the midportion of the horizontal ramus to the base of the condyle of the ascending ramus The post operative course was essentially negative and she was discharged on the 16th post operative day to be followed in the Clinic

Her course was uneventful and the graft was a successful take clinically and by x ray The intermaxillary fixation was continued for 12 weeks and the bone wires were left in

place. However, the lower wire became noticeable beneath the skin of the cheek and was
removed about five years later.

Since her immediate post-operative period she has had no particular complaints. She
has good jaw function and the appearance is satisfactory inside and outside the mouth
(fig. 3). The jaw deviates slightly to the left upon opening the mouth widely. The pa-
tient's only complaint is of a dull ache in the left side of the neck and jaw only after an
unusual amount of chewing in damp weather. Otherwise she has no trouble and is quite
well satisfied 21 years following the bone graft.

SUMMARY

The chief characteristics of giant cell tumors of the mandible have been re-
viewed, and a case has been reported which has remained cured for twenty-five
years since treated by curettment and x-ray. Also, the author has described a
technique for bone grafting the mandible which he believes has not been de-
scribed previously in this country. It is the author's belief that this technique
is as effective as it is simple, and it is his hope that it may be applied to the cases
of other surgeons as indicated.

The author wishes to thank Dr. John R. Lewis, Fellow at the Straith Clinic
for his help in the research and preparation of this paper.

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CLOSURE OF SCALP BY SPLIT THICKNESS SKIN GRAFTS

ABADES BLANCHART, M D

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The patient, J P , was a sixteen year old female, who in January, 1948 suffered complete avulsion of the scalp by a machine   The skin of the forehead down to the eyebrows, the skin of the right cheek and the right ear were lost   She received emergency treatment in the village where she worked and was first seen in the hospital in Barcelona by the writer fifteen days after the accident   The wound presented a granulating surface with marked suppuration needing daily change of dressings (fig 1)   Erythrocyte count was 3,500,000 with 70 per cent hemoglobin   Bacteriological examination of the secretion from the wound showed a mixed flora with predominance of streptococcus and staphylococcus   The general condition of the patient was not good, and she required narcotics to control the pain incurred during dressings   Liver extract was administered for seven days, with two liters a day of isotonic saline solution intravenously to replace the plasma loss, and penicillin was used locally on the wound   At the end of a week the general condition was somewhat better and the red cell count was 4,500,000 with a hemoglobin level of 88 per cent   Smears from the wound showed relatively few bacteria—one organism per two fields

Twenty-two days after the accident, under general anesthesia, the granulation tissue was removed and the entire de epithelialized surface was covered at one session with eight wide split thickness skin grafts taken with Padgett's dermatome from both thighs and the back, resulting in complete coverage of the raw surface   Owing to the long duration of the operation, a transfusion of 600 cc. of whole blood was administered   An elastic compressive bandage was applied to the head and also to the donor areas   After 25 days the dressings were removed, and all parts of the scalp were seen to be epithelialized, with the exception of some very small raw areas next to the sutures (fig 2)   The donor areas were all completely healed and the general state of the patient was greatly improved, the pains and other disturbances having disappeared after the first twelve days   After the small raw areas along the suture lines had healed, full-thickness skin grafts from a remaining hairy part of the neck were applied to form eyebrows   Finally, a wig was made which she was able to wear six months after the accident (fig 3).

COMMENT

The large, uniform split thickness skin grafts obtained by Padgett's dermatome, constitute, we believe, an excellent method of repair in these cases because in the recipient bed are favorable factors of good blood supply and firm base for adequate pressure and immobilization   With the Padgett dermatome or the Vacutome, one can obtain skin in large quantities, with early healing of donor areas by epithelialization from germinative elements of the sweat glands

a   b   c
FIG. 1. GRANULATING SURFACE OF SCALP BEFORE TREATMENT
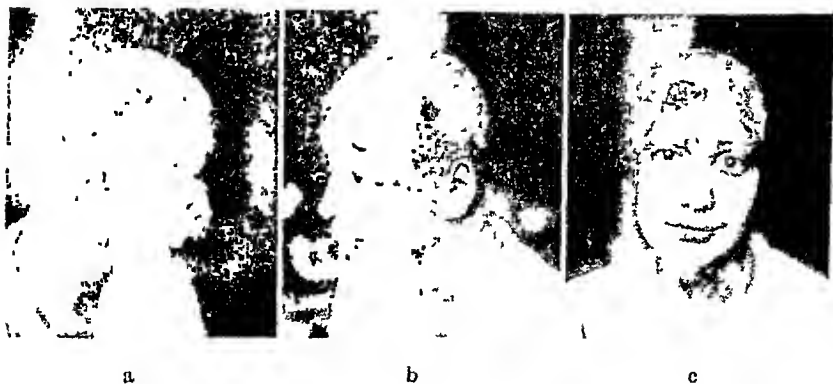
a   b   c
FIG 2 EPITHELIALIZATION OF SCALP PRACTICALLY COMPLETE, AFTER SKIN GRAFTING

a   b   c
FIG 3. APPEARANCE WITH WIG

and hair follicles. This method of repair permits coverage of the raw surfaces at one operation. It does away with the necessity of frequent, painful dressings during a period of 15 to 25 days (fig. 4).

Some authors recommend the use of tube pedicle flaps to repair the scalp, claiming that this method furnishes a thick skin with good subcutaneous tissue. The subcutaneous tissue formed beneath a split skin graft after 20 days is more than adequate in these cases, as one finds that there is enough to permit a slight sliding of the outer skin on the underlying skull. Moreover, in our opinion, the

<div align="center">a   b</div>

FIG. 4. HEALED DONOR AREAS

tube flaps present several disadvantages for this type of repair, as follows: the time required in preparation of the tubes, which delays the repair for 20 days or more; the difficulty of obtaining sufficient skin by this method in extensive scalp defects, and lastly the undue thickness of the flaps.

<div align="center">SUMMARY</div>

The author reports a case of a very extensive loss of scalp tissue which included the skin of the forehead and the eyebrows, the skin of the cheek and the right ear, successfully repaired in one operative session by wide split thickness skin grafts taken with Padgett's dermatome. He considers the employment of the split graft cut with dermatome or vacutome, the most adequate procedure for the repair of extensive losses of the scalp.

THE MOULDED ACRYLIC SPLINT FOR PALM AND FINGER GRAFTS

HENRY S. PATTON, M.D., AND JEROME C. STRAIN, D.D.S.

The sooner medical men can add modern techniques routinely for the restoration of function, the better. The adjoining case is presented as it will illustrate the practical importance of the acrylic splint in hand surgery.

The surgeon usually cannot take the necessary time to produce a good acrylic splint as easily as a well trained dentist who has the necessary equipment.

Our problem, as in the case being presented, was a common injury, a third degree burn contracture involving the distal two-thirds of the palm of the right hand due to a mangle injury in a five year old girl. This contracture prevented her from extending her hand and especially her right second to fifth fingers (see fig. 1).

The burn had taken forty-two days to heal and the patient had been traveling across the country during the initial healing burn period. No tendons were exposed. She was seen immediately after healing and active motion was continued. Three months after healing, the scar tissue was removed under tourniquet exposing the palmar fat pad and the palmar surface of fingers two to five. Bleeding was controlled with 6-0 white silk ties. A split graft, .025 of an inch thick, was taken from the "bathing trunk" area, below the umbilicus, with Padgett dermatome. The graft was applied with interrupted sutures of 6-0 black silk and the necessary darts and incisions were made parallel to the Lines of Langer to prevent contractures. A pressure dressing of gauze fluffs and a sponge-rubber lined piece of lead sheeting cut to fit the palm and fingers in their position of hyperextension was placed on the palmar aspect of the hand. The dorsum was immobilized with a padded plaster splint from finger tips to shoulder.

Maintenance of elevation was carried out postoperatively. The sutures were removed on the eighth day and healing was per primam. Splinting was continued with exercises at intervals until the mould of the hand was made on the twenty-first postoperative day. On the thirtieth day the splint was released progressively one hour every other day until the graft seemed stable (fig. 2, A, B and C). Later it was worn at night only. It is light, perforated and easily cleaned and has been made so that it will take care of growth up to a six month period. It can be opened by the parents only. The splint in this case was discarded on the ninetieth day (fig. 3, A, B and C).

From the surgeon's viewpoint, there is no excuse for improper care and every useful adjunct should be at our hand. The apparatus will not remedy poor surgery. With relaxing darts, incisions parallel to Langer's Lines, excellent hemostasis, pressure immobility and elevation of the part, we should get routinely good results.

The technique for constructing the acrylic hand splint need not be a complicated one, but does require some knowledge of the materials and their uses. The technique which we used is as follows:

An impression of the hand was made using a hydrocolloid impression material. This was cast in stone to produce the master model. This model was then dupli-
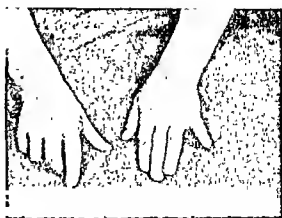
FIG. 1. A. THIRD DEGREE BURN OF PALM WITH HAND IN FORCED EXTENSION
FIG. 1. B. DORSUM WITH HANDS IN FORCED EXTENSION
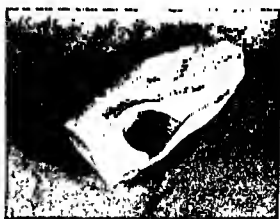
FIG. 2 A. PALMAR ASPECT OF ACRYLIC SPLINT
FIG. 2. B. DORSAL ASPECT OF ACRYLIC SPLINT
FIG. 2. C. INNER ASPECT SHOWING CLIP AND HINGE SPRING CLASPS
FIG. 2. D. SPLINT CLOSED

cated, cast in Plaster of Paris and was our working model. It was necessary, of course, to have a two piece splint. Considerable thought was given, at this time, as to where and how the two halves would be joined. The palmar portion became the largest and most bulky part. This half was waxed up first to a thickness of about 3 mm. but considerably more bulky around the periphery to provide strength and allow for trimming in case of growth. This part was then flasked and processed.
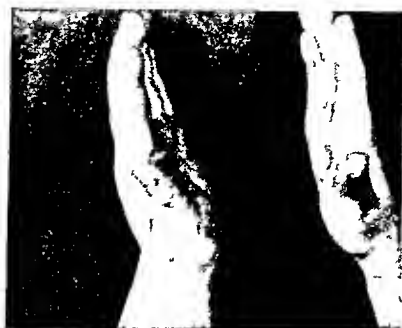
FIG. 3. A. HAND IN EXTENSION—SIX MONTHS LATER
FIG. 3. B. HAND IN EXTENSION
FIG. 3. C. HAND IN FLEXION

The flask was then opened carefully and the plaster removed from the dorsum of the plaster cast. This exposed the surface for the second half of the splint. Sheet wax was adapted to this surface and removed and processed.

We considered it necessary to put hinges on the thumb side because of the irregular contour and to increase the strength. This irregularity, however, prevented us from using the conventional type of hinge. It was therefore decided to use two loops of wires; one to engage the other. The splint was fastened by a spring wire loop over a button of acrylic on the lateral side. Numerous holes were drilled in the finished splint for aeration.

The materials necessary for the construction of this splint are available in the average dental office. The adapting of these materials to uses other than dental is limited only by the prosthesists lack of imagination.

LABIAL TRANSPLANT FOR CORRECTION OF LOSS OF THE NIPPLE[*]

WM. MILTON ADAMS, M.D.

Memphis, Tennessee

Probably the most serious complication of mammaryplasty, so far as the end result is concerned, is necrosis of the nipple. Impairment of the circulation may lead to loss of the nipple following even the most simple type of mammaryplasty. In reviewing the literature, one receives the impression that this complication is rare, yet it is probable that few, if any, surgeons who have performed a considerable number of plastic operations upon the breast have not had at least one unfortunate experience of this kind.

The only recorded method of correction of the loss of a nipple is one wherein four or five diamond-shaped sections of skin are excised in radial fashion about a center area and the edges are sewn together, puckering the skin. The area is then tattooed in a color which corresponds to that of the normal nipple and areola. Although this procedure is better than none at all, the texture of the skin is smooth, whereas the surface of the normal nipple is rough. A nipple made from a free medium thickness graft of smooth skin from any other part of the body might present a slight contrast in color to that of the surrounding breast tissue, yet would have none of the other characteristics of a normal nipple.

In an experience which has included a considerable number of mammaryplasties, the author had used every precaution against disturbing the blood supply sufficiently to produce necrosis of the nipple, but had given no serious thought to a method of repair of the defect in the event of such a complication until it arose in one of his cases.

The patient in question had moderately hypertrophied breasts. They were quite heavy and the patient complained of rather severe pain in her back and her shoulders. Since the breasts were not extremely large it was felt that a simple mammaryplasty would be preferable to a free transplantation of the nipples.

A technic similar to that described by Mornard was employed. A circular incision was made around the areola of one breast and the skin overlying the greater portion of the breast was undermined. The skin on the anterior surface of the breast was next incised in a semicircle just above and in a line corresponding to the submammary fold, and a second incision was made through the skin in the submammary fold itself. A new site high on the breast was then created for the nipple by removal of a circular area of skin of proper size and, with the breast tissue intact, the nipple was shifted upward, delivered through this new opening and sutured in place with silk. The excess breast tissue was removed from the lower central area of the gland and the remaining lateral portions were brought together in the midline and sutured with chromic catgut. Finally, the

overlying skin was drawn down and sutured to the skin edge in the submammary fold. The procedure was then repeated on the opposite breast.

It was thought at the time that the circulation to the nipples was slightly impaired, though not sufficiently to cause any trouble. On the first postoperative day, the patient developed the symptoms and signs of pneumonia, accompanied by a rise of temperature, for which she was given penicillin and sulfadiazine. The wounds of the breasts were not inspected until the fourth postoperative day. Much to our surprise, the nipples were bluish-black almost throughout,

FIG. 1. Photograph of breasts following mammaryplasty, showing a scar approximately 2 × 3 cm in diameter resulting from infection and necrosis of the nipple, and two smaller scars incident to incision and drainage of the lower outer quadrant of the breast. Unsightly scars are also present around the left nipple, from infection and necrosis.

the right being worse than the left. Wet compresses were kept on the breasts continuously and the dressings were changed daily. On the left, the necrosis involved only the superficial skin of the nipple and areola, the deeper layers being saved. On the right, however, the necrosis progressed until the nipple and the immediately underlying breast tissue became completely gangrenous. There were also several other areas of necrosis in the gland, which required incision and drainage. None of the necrotic tissue was excised until a definite line of demarcation was observed. Wet dressings were continued, and at the end of six weeks healing was complete, though the wounds left most unsightly scars (fig. 1).

The problem of the best possible procedure for correction of the loss of the

right nipple and areola was given serious thought and study   The skin of the
patient's entire body was examined, in an effort to find some part which closely
resembled that of a normal areola and nipple   It was finally decided that the
skin of the labium minor, being brownish in color and having a rough surface,
would be most suitable, further, the underlying loose connective tissue could be
transplanted with the skin as a free composite graft, thus making the graft
more pliable

FIG 2 TECHNIC OF OBTAINING LABIAL GRAFT

Under local anesthesia the superficial portion of the scarred nipple region of
the right breast was partially excised to form a bed for the transplant   Also
under novocain anesthesia, the lower part of the lip of the right labium minor was
picked up with thumb forceps, and a sufficient amount to form a nipple and
areola was cut away with one snip of the scissors (fig 2)   The labial wound
was closed with a simple running suture of silk   The graft was next spread out
over the recipient raw area of the breast, cut to proper shape, and attached
around the periphery with fine silk   The central portion of the graft was left a
little loose and sutured to give the appearance of a nipple   A pressure bandage

overlying skin was drawn down and sutured to the skin edge in the submammary fold.   The procedure was then repeated on the opposite breast.

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right nipple and areola was given serious thought and study. The skin of the patient's entire body was examined, in an effort to find some part which closely resembled that of a normal areola and nipple. It was finally decided that the skin of the labium minor, being brownish in color and having a rough surface, would be most suitable, further, the underlying loose connective tissue could be transplanted with the skin as a free composite graft, thus making the graft more pliable.

FIG 2 TECHNIC OF OBTAINING LABIAL GRAFT

Under local anesthesia, the superficial portion of the scarred nipple region of the right breast was partially excised to form a bed for the transplant. Also under novocain anesthesia, the lower part of the lip of the right labium minor was picked up with thumb forceps, and a sufficient amount to form a nipple and areola was cut away with one snip of the scissors (fig 2). The labial wound was closed with a simple running suture of silk. The graft was next spread out over the recipient raw area of the breast, cut to proper size, and attached around the periphery with fine silk. The central portion of the graft was left a little loose and sutured to give the appearance of a nipple. A pressure bandage

was then applied. When the dressing was first changed on the tenth postoperative day, the graft was found to have taken throughout.

Six months later the patient re-entered the hospital for revision of the scars about the breasts. Those around the nipple of the left breast and about the labial transplant on the right were excised. By blunt dissection, a tunnel was then made immediately beneath the transplant, and a small amount of the excised scar tissue was inserted throught the tunnel to its center, to further elevate this part and reproduce more nearly the appearance of a normal nipple (fig. 3). Elastic pressure dressings were applied to the breasts.

FIG. 3. Photograph eighteen months after free transplantation of a portion of the labium minor as a substitute for the original nipples, and six months after revision of the scars around the left nipple and resection of the scars of the right breast.

Five months have elapsed since the last operation. The patient recently reported that she had had no further discomfort, was well pleased with the result, and had been happily married for three months.

It is the author's opinion that the labium minor offers the best transplant for correction of the loss of the nipple and areola. The color is almost exactly the same as that of the normal nipple and areola, the texture, being rough, compares closely, and although the labium minor does not have an underlying smooth muscle to permit contracture of the areola and erection of the nipple, it does have a layer of loose connective tissue which makes it soft and pliable. Moreover, the technic of the transplantation is a simple one and the amount of labial tissue required is so small as to be of no consequence.

SCALPEL FOR PARING MARGINS OF CLEFT PALATE

G. KENNETH LEWIS, M.D., F.A.C.S.

Chicago, Illinois

Difficulty is often experienced in paring the margins of a cleft palate, it requires various maneuvers of the operator in following margioal mucosa. To overcome this difficulty a No. 3 Bard-Parker knife handle was cut off proximal to the detachable blade. The two parts were theo welded together at an angle of 55 degrees from the horizontal. This angle permits easy pariog of the margiu.
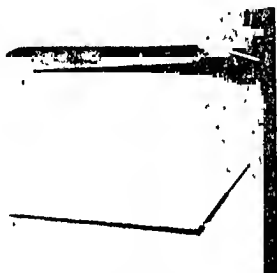
Fig. 1. The Scalpel Is Soft Rust-resisting Metal, and Any Numbered Blade for a 3 Handle May Be Used.

The surgeon will find two handles, a right and left, expedient and useful. I have found the angled haodle useful, in several places where a straight handle was difficult to maneuver.

The author is grateful to Bard-Parker for constructioo of this handle.

BOOK REVIEWS

COLLATERAL CIRCULATION, by Daniel P. Quiring, Ph.D. (published by Lea & Febiger, Philadelphia, 1949) is a study of the chief arterial and venous collateral channels of the human body. As opposed to most anatomical works, which deal with the major circulatory pathways, the author's emphasis in this text is on the "collateral circulation." By this term he designates all the subsidiary vascular channels which, with varying degrees of effectiveness, transport the blood when the primary routes of the network become occluded or interrupted.

Throughout, Dr. Quiring has handled his subject matter with the clinician's direct simplicity and fidelity to detail. After first sketching the historical background of the milestones which various anatomists and physiologists have passed in exploring the circulatory system, he proceeds to discuss collateral circulation and anastomoses for several clearly-defined sections of the body, such as the head and neck, the trunk, and the upper extremity, to cite only a few.

The author's logical approach, pared of irrelevancies to the point where the manuscript takes sometimes almost the form of an outline, makes this a book to which the surgeon, particularly one whose field is reparative surgery, will turn as a quick and reliable reference on many specialized problems of the circulatory system. Numerous splendid drawings which illustrate the work, done by Margaret Holman in both black and white and color, are based in part on original dissections. Finally, both the author and the publisher are to be congratulated on their choice of the large sans-serif type face in which the text is set; its clarity is, in itself, an invitation to the reader.—Reviewed by Clarence R. Straatsma, M.D.

SURGERY OF THE HAND. By Sterling Bunnell, M.D. The second edition of this notable work contains about 200 more pages and 182 more illustrations than the first edition published in 1944. These additions are largely the result of the author's experience in army hospital centers during and following World War II. As is well known, the successful results in treatment of hand mutilations in army personnel were in no small measure due to Dr. Bunnell's unselfish sacrifice of his personal affairs in devoting the greater part of his time visiting these centers and instilling into the younger surgeons on duty the principles to be followed.

This book is in a class by itself, and completely covers the field of hand surgery in a masterly fashion. Dr. L. D. Howard, Dr. Bunnell's associate, contributes the chapter on Tumors of the Hand. Many of the new illustrations represent the work of plastic and hand surgeons connected with the various hospital centers. For the plastic surgeon, the most interesting part of the book is the discussion of pedicle flap and free graft procedures for coverage of surface and sub-surface defects. The principles laid down are sound and are an indication of the cooperation of the trained plastic surgeons in these special hospital centers with those assigned to the repair of underlying tendons, nerves and bones. Possession of this book is an absolute necessity for anyone having any connection with hand injuries, deformities and surgical diseases, be he general surgeon, orthopedic surgeon, neurological surgeon, plastic surgeon, or one of the growing number of specialists in hand surgery.

As a noted surgeon graciously said not so long ago when asked to follow Dr. Bunnell in a discussion of hand cases: "When the nightingale sings, all other birds are silent".

George V. I. Brown, M.D.

OBITUARY

GEORGE VAN INGEN BROWN, M D

Dr George Van Ingen Brown died at his home in Milwaukee, Wisconsin, April 2, 1948, in his eighty-seventh year   He was one of the group which included Brophy, Gilmer, Cryer and others who may be said to have laid the foundations of what is now plastic and oral surgery

Dr Brown was born January 15, 1862, at St Paul, Minnesota, and received his early education there   In 1881 he received the degree of Doctor of Dental Surgery from the Pennsylvania College of Dental Surgery, Philadelphia, and from 1881 to 1898 he practised dentistry and oral surgery in St Paul, Minnesota He was a member of the faculty of the Dental Department of St Paul Medical College, which later became affiliated with the University of Minnesota   He was a member of the first Dental Examining Board of the State of Minnesota and its president during his second term of office   Always seeking educational improvement, Dr. Brown took courses at the University of Minnesota Medical School in 1894 and in 1895 received his M D degree from the Milwaukee Medical College, and Master of Surgery from the same institution later in the year An M D degree was again conferred on him by Marquette University in 1909 In 1898 Dr. Brown moved to Milwaukee, Wisconsin, and began to limit his practice to plastic and oral surgery   He continued practice there until his death   While not limited to this special subject, his main interest was in the correction of cleft lip and palate, and many advances in the management of this affliction are attributable to him   It is safe to say that with the possible exception of Brophy, no one in the early part of the twentieth century did as much as Dr Brown to make known to the medical world the possibilities of help for these cases   Dr Brown went all over the United States and abroad teaching others how to care for cleft lip and palate   He was Professor of Operative Dentistry and Oral Surgery in the Milwaukee Medical College Dental Department, 1898-1902, Professor of Oral Surgery, University of Iowa, 1903-1910, Professor of Oral Surgery, Southern Dental College, Atlanta, Georgia, 1909-1915, Professor of Plastic and Oral Surgery, University of Wisconsin Medical School, 1920-1937, and Professor Emeritus from 1937 until his death   He was a special lecturer in oral surgery at the following institutions   University of Illinois Dental Department, 1902-1903, University of Tennessee, 1904, Vanderbilt University, 1905   In 1903, Dr Brown was appointed by the Government as delegate to the International Medical Congress, Madrid, Spain, and in 1911 made a report on harelip and cleft palate at the International Medical Congress at Budapest, Hungary   In 1914, he was in charge of the program and contributor on the subject of harelip and cleft palate at the Congress of the American College of Surgeons at London, England   In 1921, he was awarded the Jarvie

Gold Medal of the New York State Dental Society, for his contributions to oral surgery.

Dr. Brown's hospital appointments were as follows: Surgical Staff of St. Mary's Hospital, Milwaukee, Wisconsin; Columbia Hospital, Milwaukee; Milwaukee County General Hospital; Wisconsin General Hospital, Madison, Wisconsin; Wisconsin Orthopedic Hospital for Children, Madison, Wisconsin. Consulting Staff, Milwaukee Children's Hospital; Honorary Visiting Staff, Forsyth Dental Infirmary, Boston, Mass. He was a member of many medical and scientific societies, among which were: American College of Surgeons; Milwaukee Academy of Medicine; Milwaukee Surgical Society; Interstate Postgraduate Medical Association of North America, of which he was President 1920–21, Presiding Officer and Speaker 1920–1934 inclusive, and Trustee from 1920 to his death; Honorary Member of the American Society of Plastic and Reconstructive Surgery. He was a Founder Member of the American Board of Plastic Surgery.

For many years Dr. Brown held a commission in the Medical Reserve Corps of the Army. On entrance of the United States into the World War in 1917, he was placed on active duty as a major and was the chief medical examiner in Milwaukee for those seeking commissions in the Army Medical Corps. In August, 1918, he was called to the office of the Surgeon General, Washington, D. C., and placed in charge of the Section of Oral and Plastic Surgery. Among other activities he organized the special courses of instruction on oral and plastic surgery for medical and dental officers at Camp Greenleaf, Georgia. He was also assigned as consultant in oral and plastic surgery at Walter Reed General Hospital, Washington, D. C. upon inauguration of the service for care of maxillo-facial injuries returning from overseas. In March, 1919, he was returned to inactive status with the rank of Colonel. He then became commanding officer of the 326th Medical Regiment, until his transfer to the auxiliary reserve.

Dr. Brown's contributions to the literature were too numerous to be recorded in detail, but they culminated in the publication of his book—Surgery of Oral and Facial Diseases and Malformations, of which four editions appeared, the last in 1938. This book was an accepted standard text book in many medical and dental colleges, as well as the Medical Departments of the Army and Navy.

In 1884 Dr. Brown married Elizabeth Kathleen Selby Jones, who died several years ago. He is survived by a son, Selby V. I. Brown, of Milwaukee, Wisconsin, born in 1887.

From the foregoing it is readily seen that Dr. Brown's contributions have helped immeasurably in the advancement of the special surgery to which he devoted his life.

VOLNEY B. HYSLOP, M.D.

SKIN GRAFTS

Greeley, Paul W. Skin Grafts *Surg Clinic North America*, Feb 1948 p 113

As pointed out by Greeley wound closure has become dependent upon skin grafting procedures Surface defects are covered ideally by adjacent tissues, but many because of size and location must be covered by a properly selected graft cosmetic and physical characteristics and degree of complexity being taken into consideration Skin grafts grow on practically any viable area (periosteum, bone, perichondrium tendon, fascia, fat, muscle or granulations) not contaminated by a major virulent infection and uncontrollable hemorrhage The simplest graft possible, compatible with acceptable end results, should be used The thinner the graft, the greater are the chances of a take, the thicker grafts give maximum function and cosmesis

An elementary classification of free grafts and pedicle flaps is presented together with the sites of application of each and the technic for their use

Barker, Donald Earl New Donor Areas in Skin Grafting *Ann Surg* 127 410, Mar 1948

As observed by Barker calibrated skin grafts can be taken with the dermatome from the thighs abdomen and back in thin individuals and, in addition, from the chest in the obese In many cases the suitable areas

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are destroyed by the burn, and the chest, upper back and scapular regions are too irregular because of wasting of subcutaneous tissue, and bony protuberance. By injecting saline subcutaneously and obliterating depressions, grafts can be taken from these irregular areas. The technic used is as follows: An area slightly larger than the dermatome is marked off with methylene blue. A long needle is used to infiltrate, care being taken not to puncture the skin in the area marked off (the leaking interferes with adhesion of the cement), the cement is applied and the graft cut in the usual manner. Two cases in which the method was used are presented.

Hynes, Wilfred: **A Simple Method of Estimating Blood Flow with Special Reference to the Circulation in Pedicled Skin Flaps and Tubes.** *Brit. J. Plast. Surg. 1:* 159, Oct. 1948.

An atropine absorption test which provides a simple method for estimating the blood supply of a given tissue, both qualitatively and quantitatively, is described by Hynes. It gives a measure of the circulation, that is, both the arterial blood supply and the venous blood drainage. It enables the transfer of skin flaps in the shortest time. The previous methods for testing the circulation of a given area of skin are discussed. One twenty-fifth to $\frac{1}{50}$ of a grain of atropine is injected into the portion of the flap to be tested. The absorption of the atropine is indicated by tachycardia, changes in the pupil, and dryness of the mouth.

Penn, Jack: **A Case of Anal Reconstruction by Means of Local Skin Flaps.** *Brit. J. Plast. Surg. 1:* 87, July, 1948.

Penn describes an operative procedure for reconstruction of the anus in a patient who had had multiple operations, over a period of 10 years, for what originally was diagnosed as Fissure in Ano. The perianal skin was unhealthy, warty and moist; no musculature was obvious in the external sphincter; the canal was rigid and fixed. Pre-operatively the patient received succinal sulphathiazole for 4 days, and the bowel was washed out on the evening and morning prior to operation. The operation consisted of excision of all scar tissue. The perianal defect was repaired by use of anterior and posterior V-Y advancement flaps. Postoperatively the patient was given penicillin and phthalyl sulphathiazole. There was no incontinence or symptoms after operation.

Buchan, A. C.: **An Unusual Leg Flap.** *Brit. J. Plast. Surg. 1:* 96, July, 1948.

A case of a chronic ulcer on the anterolateral surface of the right lower leg associated with arthrodesis of the right knee is presented by Buchan. The common cross-leg flap type of operation was impossible. A skin flap was prepared on the lower lateral surface of the right thigh; the flap was attached to the lower medial surface of the left leg. At a later time the ulcer and scar tissue were excised and the flap detached from the right thigh, the left leg being used as carrier, and the flap sutured to cover the defect on the right ankle. Raw surfaces of the flap bed were covered with split skin grafts. Immobilization was by plaster of paris casts. Following the second cross-leg stage there was a minor degree of skin loss at the proximal corner of the skin flap, and a pressure sore developed on the anterior surface of the right tibia. Healing was by primary intention. The time required for the entire procedure covered 13 weeks.

NOSE AND LIP

Szlazak, Jan: **Repair of Nasal Defects with Free Auricular Grafts.** *Brit. J. Plast. Surg. 1:* 176, Oct. 1948.

A series of cases of nasal defects repaired with free auricular grafts in which the size of the defect was larger than those commonly recorded, are reported by Szlazak. The 4 cases are as follows:

Case 1.—An alar defect, 1 cm. x 1 cm., was corrected by a lobule graft.

Case 2.—In a defect of both alae and part of the nasal tip, (a) a first graft, 4 cm. x 1.3 cm., was taken from the right helix just below Darwin's tubercle. The donor area was covered by a postauricular flap. (b) One month later a graft, 3.8 cm. in length, was used, to correct the opposite alar defect.

Case 3.—A graft, 2.5 cm. in length x 1.7 cm. in depth, was used to correct an alar defect in a 75-year old patient who had had a rodent ulcer treated with x-rays for two years.

Case 4.—There was loss of the lower four-

fifths of the columella and part of the membranous septum which, when scar tissue was excised, left a triangular defect, 1.5 cm × 1 cm A graft was taken from the upper part of the right ear, and the donor area was closed by direct suture

In all 4 cases the grafts took well

Brown, James B , and McDowell, Frank. Surgical Repair of Cleft Lips *Arch Surg* **56** 750, June, 1948

Brown and McDowell regard cleft lip and palate as the most common congenital deformity that may be surgically corrected The incidence of this deformity, alone or in combination, is approximately one in every 665 births (The statistical basis for these figures is not presented)

Two recent advances in the development of surgical correction are (1) A new method of marking which insures the most symmetrical nostrils, and (2) the formation of a smooth full vermilion border in the repaired lip

Until modern times, the repair of cleft lip was grossly unsatisfactory because it left the nostril slumped and flared, and a retracted vermilion border of the lip

In retaining symmetry of the nostrils, the slanting columella and displaced rim of the nares must be re-aligned The columella is moved to the midline, and the ala tubulated and placed in toward the columella

The symmetric points are marked with a mechanical drawing pen in 5 per cent methylene blue The desired points are then established by pulling the two sides of the cleft into an overlapping position and adjusting the relationship of the two sides correctly

The columellar side of a complete cleft lip is deficient in the lower border This is corrected by forming a triangular flap of full thickness tissue from the alar side and fitting this to supply the deficient tissue on the columellar side

The development of technics is discussed briefly

Secondary operations are of great importance and should be done to obtain the maximum final results Osteoplastic operations on the nose, flaps rotated from the lower lip and cartilage transplants to the nose are frequently indicated

HAND

Morel, Fstlo D , and Tubtaaa, R Burns of the Hands (Ftrst Part) *J de Chirurgie* **64** 359 1948

Morel and Tubtana state that classification of burns of the hand in first, second and third degree lesions is of less value than in any other region A deep localized burn can be less important than an extensive second degree burn, which can be followed by severe vascular reactions or a serious infection, leaving a useless retracted hand

Of the reactions following burns the most important is edema Its functional influence is always extremely serious Edema appears in every sort of burn but specially in the infected ones The tissues are imbued with fluid and the circulation becomes insufficient In time fibrinous deposits become organized, fixing the deformities Soon the lesions reach a definitive state, and restoration is almost impossible

Infection is one of the most common complications of burns If allowed to increase it can transform a second degree burn into a deep third degree one The granulation tissue is a factor in retraction and sclerosis

According to the seriousness of the burn, the special reaction of every tissue in the hand has been studied by the authors The skin of the palm has good resistance but the underlying fascia makes free grafts rather insecure The dorsal skin is thin and fragile but free grafts take easily It is very difficult to differentiate second and third degree burns because there often remain islands of skin with persisting vitality which can be useful points of regeneration

The tendons are seldom directly involved by the burn To judge the extent of the lesions one must wait for the shedding of dead tissues between the 7th and 10th days If any tendon remains uncovered it must be protected at once by a flap The extensors are injured more often than the flexors but involvement of the latter has a very serious prognosis

The extrinsic muscles of the hand act through the tendons and being in the forearm, escape direct burns, the intrinsic muscles lie in the middle of the affected region The function of the hand depends on the balance between both groups of muscles

When one is involved their proper relation is lost, and a severe deformity and lack of function are unavoidable. The hand assumes the shape of a claw, with fixed extension of the first phalanges and flexion of the last two. In deep dorsal burns retraction can cause subluxation of the metacarpophalangeal joint.

Purulent arthritis is a common result of burns. But even if the joints are not directly involved, they have a strong tendency to become rigid. Atrophy of the interossei and retraction of the ligaments augment the effect so that hyperextension of the metacarpophalangeal joints and flexion of the interphalangeal joints soon become irreducible.

The dorsal vessels being scarce easily become involved. The volar vessels, which are well protected by fascia, will react mildly rather than become necrotic. In the fingers lesion of the collaterals causes ischemic gangrene. Part of the tip of the finger is lost, leaving a thin stump covered by scar tissue.

Early treatment of burns of the hand with wet dressing or with sulfonamide ointment is advocated. Surgical revision is undertaken as soon as possible, the aim being to eliminate all dead tissue. Immobilization is indispensable in overcoming infection and in avoiding a crippling position of the fingers. If unduly prolonged it might lead to serious stiffening of the joints. Morel and Tubiana therefore advise immobilization with splints, allowing limited motion of the joints during the healing period.

Of the numerous kinds of treatment for burns they prefer the pressure dressing. The plaster cast with limited mobilization of the fingers is reserved for patients requiring transportation. The use of the Bunyan bag is recommended in infected burns. The authors also suggest combining any of these procedures according to the period of healing and the particular conditions in each case. Adoption of a routine treatment is stressed in order to insure the best average results.

Secondary treatment is directed to covering the granulating surfaces, and to restricting the tendency to delayed healing, with retracting scars and impairment of function. The use of a graft is recommended as soon as a thin layer of epithelium begins to cover the borders of the granulating surface. In infected wounds the authors prefer postage-stamp grafts as a type of temporary dressing. In clean wounds they use split grafts, especially in dorsal burns where definitive results can be easily attained by this means. Whenever a graft does not take or the surface obtained by fragmentary grafting is not suitable, they recommend excision of the scar and recovering the resulting wound with a layer of skin of good thickness.

Ardao, H.: Substitution of the Thumb by the Index Finger. (Pulgari zaclón del dedo Indice). *Bol. d. Sociedad de Cirurgia del Uruguay, 18:* 78, 1947.

Ardao believes that the best solution for absence of the thumb, and for very serious lesions of the thumb or the thenar region is to bring the index finger to the place of the missing thumb. There are other solutions which are not as good, as the deepening of the groove of the first interdigital space for the implantation of an osseous thumb with a skin cover. The index finger provides a thumb with sensitivity and good control. The stereognostic sense and the control of the finger allow, among other advantages, the sensation of anything or any substance that could be harmful to the finger.

Ardao presents the case of a patient who had a very serious old wound of the thenar region and a painful and useless thumb. The thumb was amputated and the index finger, with all its tendons, vessels and nerves, was brought to the place of the first metacarpal. The second metacarpal was sectioned at about the proximity of the head. After an uneventful postoperative period the result was perfect, as the patient is now resuming her work as a nurse in the hospital. As a further detail the author says that the bones were sutured with steel wire resulting in good union.

Pedemonte, P.: The Problem of the Restoration of the Thumb. (El problema de la reparación del pulgar.) *Bol. d. Sociedad de Cirurgia del Uruguay, 18:* 80, 1947.

The wide experience of Pedemonte in traumatic surgery of the hand warrants him in saying that the quality of the restoration of the thumb depends fundamentally on two conditions: (1) There must be left some remains of the first metacarpal joint, and (2)

these remains must be articulated at the carpometacarpal joint. Fortunately, the majority of cases of amputation of this finger meet this condition and complete traumatic amputations of the thumb occur very seldom. A common situation is that section passes through half of the proximal third of the first metacarpal and consequently the segment will be mobile if a good physio therapy treatment is provided in the after care. The remaining muscles still attached to it are sufficiently strong, as to mobilize the finger in the correct way. But even if this mobile segment is not available, restoration can be attempted but the new thumb will be just a fixed stop, still very useful as a manual pincer to handle objects by pressing them against it. It has to be realized that a hand without a thumb is practically useless and even a reconstructed thumb is better than none. Pedemonte describes three procedures to reconstruct a missing thumb: (1) phalangization; (2) transplantation of a finger and (3) complete reconstruction of a new thumb.

The phalangization attempts to form a pincer by deepening the first interdigital space. The first metacarpal is a mobile part of the pincer which handles objects by pressing them against the fixed part which is the second metacarpal. Indications for this procedure depends upon the following conditions: (1) that the first metacarpal be totally preserved or at least half of it; (2) that the carpometacarpal joint be mobile and (c) that the muscles which move the first metacarpal be sufficiently powerful.

The technic for this procedure is easy requiring only the transposition of the insertions of the adductor pollicis to a higher position on the first metacarpal. The stump is of excellent quality, with good sensitivity but functionally the pincers provided by it are poor lacking power and enough opening of the jaws. Only small objects can be handled easily, and the phalangization almost always requires lengthening of the stump by a prosthetic appliance. The best indication would be the lack of the thumb at the meta carpophalangeal joint with loss of the four fingers. Even then the author believes that a much better result could be obtained by combining a tubular transplant to the first metacarpal with deepening of the third intermetacarpal space to provide a fixed opposition to the moving transplant. The pincers would be much more useful even if the work involved in the reconstruction is greater.

Pedemonte is opposed to the transplantation of toes as this technic is not easy. It requires great sacrifice on the part of the patient because of the long immobilization the new finger never has a satisfactory aspect and there are frequent complications during the postoperative period. A long time is required for the return of sensitivity (one to to two years) which is never complete. There are often trophic changes and the joints have a tendency to stiffen which in the course of time limits the mobility to the carpometacarpal joint.

The substitution of the index finger by the thumb is a good procedure because it provides a movable finger, with good sensitivity and without trophic changes. The operation is often successful and has the advantage of being performed in one stage. The most important drawback is that it requires the sacrifice of a normal finger to attain the result. The technic is rather difficult and in many cases the lack of skin makes a free graft of skin necessary where the index finger was taken.

Referring to the reconstruction of the thumb by building a new finger Pedemonte endorses this procedure, having had very good results with it. The greatest advantage is that the technic is extremely easy for a plastic surgeon. There is a multiplicity of stages but all of them are simple. The opening of the jaw of the pincer is quite big. The power is sufficient and restoration does not require the sacrifice of another finger. The aspect of the reconstructed jaw is quite good and the results are always satisfactory in good hands. The author does not agree with Bunnell regarding the importance of the lack of stereognostic sensitivity. His experience shows that this last factor is only of relative value as long as the patients take some elementary precautions to avoid trauma.

FACIAL CLEFTS AND THEIR SURGICAL MANAGEMENT IN VIEW OF RECENT RESEARCH*

WAYNE B SLAUGHTER, M D , D D S ¹ AND ALLAN G BRODIE, D D S , Ph D ²

INTRODUCTION

Once in every 770 live births there appears an individual with a cleft (hare) lip, a cleft palate or some combination of cleft lip and palate (13) Although not so considered in the past, these individuals are crippled children in the truest sense of the word and their care and rehabilitation constitutes a problem of major proportions

It has been taught quite universally that it was necessary to correct cleft lip and palate defects by surgery at as early an age as the infant could tolerate the operation The reasons given for such intervention have been (1) the desirability of separating the nose and mouth cavities in order that the child might develop normal breathing habits, (2) the prevention of the return of food through the nose and the promotion of easier feeding, (3) the establishment of normal physiological aeration of the nose in order to assure development and to minimize middle ear infection and (4) improvement of the appearance of the face

In a proportion of these cases, all or most of the objectives enumerated above have been attained at the time of the operation but there has been a discouragingly large number in which the result at puberty has been far from satisfactory from either a cosmetic or a functional point of view

In addition to being subjected to multiple operations for the purpose of keeping the defect closed, these growing individuals have suffered added handicaps in the form of speech inadequacies, various nasal, oral and pharyngeal disturbances, badly deranged teeth and physiognomies that became steadily more repulsive as they approached adulthood As a result they had a tendency to exhibit striking similarities in their psychological responses and frequently came to be looked upon as maladjusted or even mentally deficient persons Their demand for rehabilitation has brought a realization of the magnitude of the problem and this in turn has begun to bring under scrutiny the methods that have previously been employed in their management

During the past twenty-five years a great deal of research has been directed toward the growing child and a considerable part of this work has concerned itself with head and face growth The development of the cranium and face have been studied in large samples of various populations by the methods of physical

anthropology. These have been largely of a cross sectional or averaging nature, controlled by the usual statistical measures (16). In a similar manner, the dentition has been studied by the measurement of plaster casts of the dental arches. More recently (1930) a method was developed which afforded a more exact means of appraising growth of the individual. This method was cephalometric roentgenology (1), which made possible the measurement of the growing head from x-ray films with all of the accuracy formerly possible only in direct bone measurements. The apparatus permitted an identical positioning of the same individual over any interval of time so that the serial roentgenograms were strictly comparable to each other.

The growth patterns of numbers of growing children from twenty minutes after birth until fifteen years have already been accumulated (3) and other series upon which observations were started at older ages extend to the twenty-fifth year (1). In addition to these studies of the average child, others have been directed at children with various congenital deformities of the cranium and face (4). Until recently these researches have been of only academic interest to the practitioners of medicine and dentistry.

The x-ray method referred to yields exact information on the direction and magnitude of growth but is of course inscrutable as to *where* such growth occurs. For a study of the *sites* of growth a different method has been necessary. It consists of feeding or injecting a vital stain for which only growing bone has an affinity and it has been applied to animals including the monkey, whose growth pattern is very simiilar to that of man (10, 11, 12, 14). From the findings derived from the employment of these two methods the knowledge of the mode of growth of the head has been quite completely worked out and can now be applied to clinical problems such as the one here considered.

THE GROWTH OF THE HUMAN HEAD

The studies referred to in the introduction have yielded the following picture of the normal growth processes of the cranium and face.

The brain-case, after recovery from birth-molding (within three days following normal delivery on the average) assumes its typal pattern. This is thought to be determined by the size and form of the brain. Extension of the margins of the vault-bones continues until the fontanelles are closed and the sutures are established. In the base of the cranium there are certain synchondroses (sphenooccipital, sphenoethmoidal, jugular, and others) which remain almost to adulthood and slowly increase the dimensions of this area by cartilage proliferation. Both sutures and cartilaginous junctions grow slowly postnatally, the cranium being relatively large at birth.

In the face itself there is generalized growth on almost all surfaces of all bones until about the fifth year. After this, surface growth tends to disappear or become so slight that it is not discernible by any method except microscopy. Certain specific sites of growth remain, however. These have been very active from the beginning and they continue at a high rate of activity almost to the completion of growth. For the purposes of this paper only a few of the major sites will be

considered, viz, the frootonasal suture, the zygomatico-maxillary suture, the pterygomaxillary suture and the head of the mandibular condyle (6, 7, 8, 9, 15) It will be noted that all of these except the last constitute junctions made by the maxilla with various supporting bones These are the sites at which a vital dye, such as Alizarine Red 'S', is always found in the experimental animal

When the disposition of the dye at the above named sites is studied (Fig 1), it is readily apparent that it is always located on the maxillary side of the suture, indicating that it is this bone that is responsible for most of the growth changes Thus, upward growth occurs at the maxillo frontal junction, backward growth at the pterygo-maxillary junction and upward and backward growth at the zygomatico maxillary junction Combined, these lead to a downward and forward positioning of the face
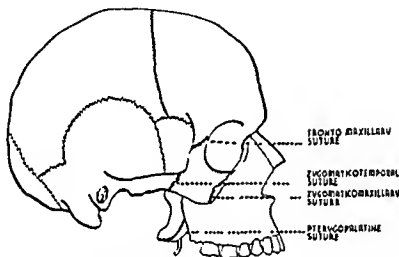
THE SUTURAL SITES OF MAXILLORY GROWTH
NOTE THE ARRANGEMENT OF THE FRONTO-
MAXILLARY ZYGOMATOTEMPORAL ZYGOMATHO
MAXILLARY AND PTERYGOPALATINE SUTURES IN
THE SAME INCLINATION FROM ABOVE DOWNWARD
AND BACKWARD

FIG 1   GROWTH SITES OF THE FACE

The serial roentgenographic study of individuals during the growth period reveals that the contributions made by these sites are so harmoniously integrated that the total pattern remains remarkably stable from birth to adulthood The floor of the nose, the occlusal level of the teeth, and the various frontal planes maintain parallelism as age progresses and the angular relations between them remain constant (3)

The mandible, although an independent bone, shows a similar orderliness in its growth and a similar integration with that of the middle face Its most important growth center is the superior, posterior surface of the condylar process which, by cartilage proliferation similar to that of an epiphysis, causes a downward and forward positioning of the entire bone Again, this growth is so integrated with that of the middle face that the lower face that the lower mandibular border descends in a parallel manner and maintains a constant angular relation to stable planes of reference in the cranium Thus the total face may be viewed as a mosaic, each

part of which enlarges during growth in just the proper direction and amount to maintain the stability of the whole (2, 5, 15).

What is of equal if not greater interest to the clinician is the fact that congenital deformities behave in an identical manner. Longitudinal studies of children exhibiting such defects reveal the same tendency toward stability of the pattern. These aberrations have their inception during the early embryonic period of intra-uterine life and are probably of short duration. Once recovery has occurred, however, the various parts pursue their now relatively normal paths and grow at normal rates. The original distortion or disproportion remains but it becomes no worse unless a specific growth or adjustment site has been permenantly affected. This is most readily demonstrated in cases where one of the synchondroses of the cranial base is obliterated or where the cartilage at the head of the mandibular condyle has been temporarily affected.

Only in the case of the mandibular condyle has it been possible to demonstrate experimentally the effects of interference with a specific growth site. The proliferative activity of this area is subject to damage by a variety of agents. Injury resulting from falls or blows, middle-ear infections, arthritis, surgery, or other traumatic agents all may be factors. The resulting deformity is most striking. Growth in the ramus of the mandible is arrested immediately and the bone can no longer keep pace with the development of the middle face. It falls steadily behind and develops a typical form that is characterized by a marked antegonial notch and a bending down of the body. The deformity is progressive until growth ceases.

A comparison of operated and non-operated patients with clefts of lip and palate points strongly to the possibility that something of a similar nature occurs in the maxillary area as a result of surgical interference. The degree of the deformity seems to depend upon the extent of the surgery and the time at which it is performed. Such surgery involves one of the chief areas of growth and adjustment of the middle face and if it results in even a diminution of the circulation to the parts it imposes a handicap that will never be entirely overcome.

As has been pointed out, the tuberosity of the maxilla, growing backward against the pterygoid process, a fixed base, is the agent responsible for the forward development of the middle face. Postnatal growth at this site is in an amount equal to the anteroposterior dimensions of three molar teeth. An equal amount of growth occurs in the palate at the transverse suture. The rich blood supply necessary for this prolific growth is derived principally from the posterior palatine vessels. One has only to examine a few cases in which multiple operations have been performed in this area and note the dense, unyielding nature of the resulting scar to realize the insurmountable handicap that has been imposed by surgery.

What has been said thus far pertains to the cleft palate and it will be noted that growth arrests in the vicinity of the maxillary tuberosity, whether due to surgery or other causes, result in a failure of the middle face to move forward at the same rate as the rest of the face. In short, it amounts to a failure in positioning.

The cleft lip is a problem of a different sort. In this defect the continuity of the labial and buccal musculature is broken but since the principal attachment

of the muscle mass is on the maxilla itself there is no effect on the positioning of the bone These defects influence only form

The dental arches and alveolar processes are normally molded around the tongue by the action of the buccinator and lip muscles and the interplay of forces between them determines their size and form Any break in the restraining action of the lips or cheeks permits the tongue to expand the dental segments Not infrequently a child born with a cleft lip will exhibit a maxillary arch sufficiently wide to fall completely outside that of the mandible The chief objective of cleft lip surgery should be the establishment of normal relationships between the tongue and the lips in order that the dental and alveolar arches may be molded into their correct forms To accomplish this, certain principles of development and growth must be kept in mind

Embryological processes are strikingly similar regardless of the part or organ that is forming First the analage appears, composed largely of undifferentiated cells Then histodifferentiation occurs with its cellular changes and this is followed by the delineation of form Immediately thereafter growth or enlargement commences

It should be remembered that all parts are not initiated simultaneously In the head region the brain is the first part to be differentiated and it goes through its various stages and begins its growth before there is any indication of other parts These appear one after the other and each goes through the various stages mentioned above Thus there is overlapping of stages, one part beginning its growth before another has even been initiated When an interruption occurs it affects all processes taking place at that instant

In the case of the cleft lip the only failure may be that of nonunion between the globular process and the adjacent lateral nasal process and the cause might be operating for a very short period of time Events occurring either before or after would not be affected and the globular process would be endowed with all of its normal potentialities, viz, the differentiation of teeth, muscle and epithelium True, it would not have a normal appearance since it had not been influenced by the restraining forces of adjacent parts but it should be viewed as a part endowed with the potentialities of normal growth and normal form

APPLICATION OF RESEARCH FINDINGS AND METHODS TO SURGERY OF THE CLEFT PALATE AND LIP

If conclusions based on the above investigations are valid they impose certain conditions on surgical procedures involved in cleft palate and cleft lip correction They strongly suggest that there must be no unwarranted trauma to soft tissues and no interference with its blood supply Any fracturing of bone or stripping of periosteum in the effort to gain approximation is to be avoided if permanent damage to growth sites is not to result

For the past five years one of the authors has followed these precepts as closely as possible in the handling of a sample of 1319 cases and although no pretense is made that all problems have been solved the results are encouraging enough to warrant this report

In order to follow the growth progress of the children involved in this study,

cephalometric x-rays, head plates, plaster models and photos were the main methods of record. Cephalometric studies were made with the head oriented in such a position that the axial ray passed through the external auditory meati. Tracings were made of the films and certain anatomical points of reference were employed for the determination of planes and angles that were used in comparison with normal controls. Fig. 2 represents a tracing of a well developed facial skeleton of a 12 year old male and indicates some of the points, planes and angles employed in the study.
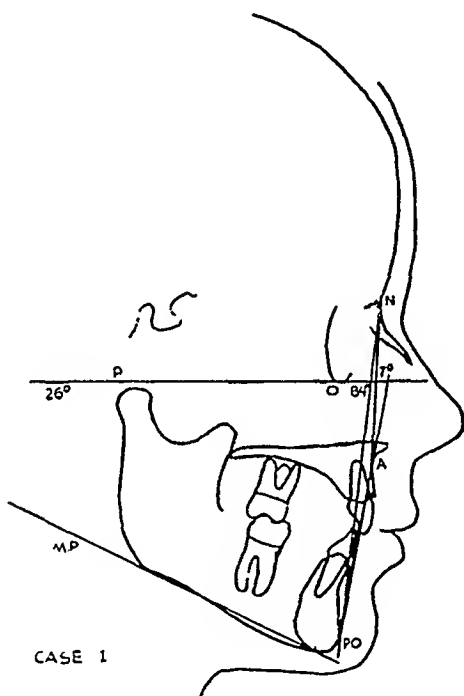
Fig. 2. Tracing of cephalometric study of a 12 year old male whose general measurements are within normal limits. P. O. The Frankfort horizontal plane. N. Po. The facial plane. N. S. Po. The angle of convexity or concavity measured (+ or −) by its amount of deviation from the straight line N-Po. M. P.-P. O. The mandibular plane angle.

The Frankfort horizontal plane (P — O) is one used generally by the physical anthropologist to relate cranial and facial structures. It represents a plane that travels through the two porion points and the lowest point of the rim of the left orbit. The facial plane (N — Po) is a frontal plane which travels through nasion and is tangent to the bony chin at pogonion. The angle made by this plane and the Frankfort horizontal is taken as a measure of the relation of face to cranium, i.e., whether retrusive or protrusive. The angle of convexity (N — A — Po) is constructed by connecting nasion and pogonion with A (the most recessive point below the anterior nasal spine). This angle is a measure of the degree of forward development of the maxillary base. M. P.

(mandibular plane) is constructed as a tangent to the lower border of the mandible near the angle and at the cross-section of the symphysis. The mandibular plane angle is the angle formed by this plane with the Frankfort horizontal.

Figure 3 represents the tracing of a 19 year old male, born with a unilateral cleft of lip and palate. Closure of the lip had been done at 19 months of age and closure of the palate at 12 years of age. The soft tissue damage to the nose at the time of the closure of the lip is evident in the tracing. Although the growth of the middle face has been retarded to only a moderate degree, the normal mandible appears protrusive by comparison. This results in the concavity in the facial

CASE 7
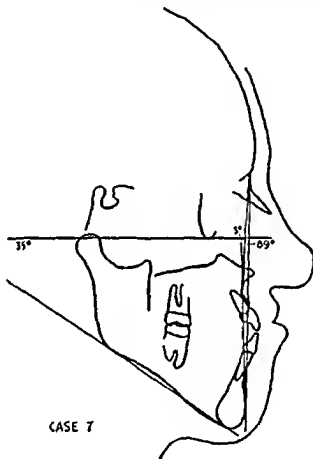
angle that has often been described as the classical facial expression of a person with a cleft of the lip and palate. It must be credited to the growth interference induced by too much or improperly timed surgery.

Figure 4 represents the tracings of an 11 year old boy whose palate was closed at 15 months and lip at two years. In this case there was an extreme mandibular growth arrest which tended to mask the maxillary arrest producing a fairly passable soft tissue profile. Overlying tissues soften the harsh bony angulation that would otherwise be evident with such an extreme mandibular plane angle.

The case presenting the greatest damage to growth centers ever encountered
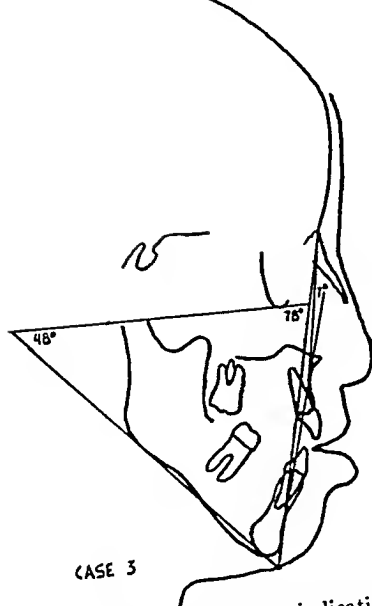
FIG. 4. Cephalometric tracing of 11 year old boy indicating the changes that may be expected following surgery on the palate at 15 months and the lip at two years of age. In this case there was, in addition, a marked mandibular growth arrest. The combined defi-ciencies resulted in a fairly passable soft tissue profile.
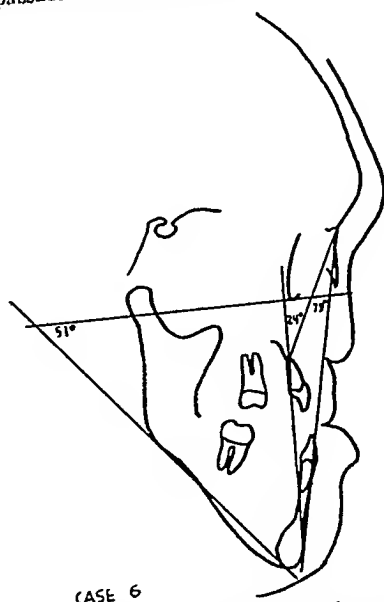
FIG. 5. Case presenting the greatest damage to growth centers of any case seen in our clinic. Patient is a 23 year old female, born with a unilateral cleft of lip and palate. Sur-gery was undertaken each year for the first 14 years of her life. The result was described as satisfactory, by the operating surgeon, because the lip was intact and the palate closed.

The wide free-way space and the binding scar tissue masses limit the amount of recon-struction that can be done either by surgery or by means of a prosthetic appliance.

in our clinic is shown in Figure 5 This female, aged 23, was born with a uni lateral cleft lip and palate She was subjected to an operation on either her lip or palate or both, every year for the first 14 years of her life Her surgeon de scribed the final result as satisfactory because the lip was intact and the palate closed But the patient has a very natural and strong desire to look normal' Her wide free way space limits the amount of building up that can be done with

a prosthetic appliance She exhibits phenomenal adaptation of the deformed structures which enables her to speak well The rehabilitation of this case will necessitate orthodontia, surgery and prosthetic restoration

The next three cases are inserted here to indicate the measures that are neces sary when the attempt is made at rehabilitation of individuals who have suffered growth arrests

Figure 6 illustrates a patient who had been operated at an early age for closure

of a bilateral cleft. The philtrum was used as a columella with the result that there was too much tissue in the inferior border of the nasal septum. The resulting tension inhibited the development of the maxilla and in order to give her a passable profile (Fig. 7) it was necessary to free the lip and insert a prosthetic appliance over her own teeth. This yielded the result shown in Figure 8.

FIG. 7. The anteroposterior dimension of the maxilla has been increased by placing a prosthesis over the existing dentition. Although a passable cosmetic result is obtained it is felt that the basic surgical principles were violated by too much surgery at too early an age resulting in retardation of growth throughout the middle third of the face.

In Figure 9 the tracings of a 16 year old male indicate the results of surgical closure of a unilateral cleft of the palate at 15 months of age and of the lip at 3 years. The benefits that could have been gained by first closing the lip and permitting it to act as a molding agent have been overlooked. This tracing was made after extensive orthodontic treatment and after the insertion of a prosthetic appliance designed to increase the anterior-posterior dimension of the maxilla.

The tracings reveal that even with the central incisor of the appliance overriding the lower central incisors, the maxilla cannot be brought forward enough to give a good cosmetic result

Figure 10 shows the tooth arrangement of an 18 year old male who was born with a bilateral cleft of the lip and palate An early repair was made of the lip only The premaxilla with its contained four anterior teeth is completely free from attachment with the maxilla Figure 11 shows the teeth of this same patient eighteen months later The premaxilla and teeth have been repositioned solely by orthodontic methods The left lateral incisor is attached to the permanent
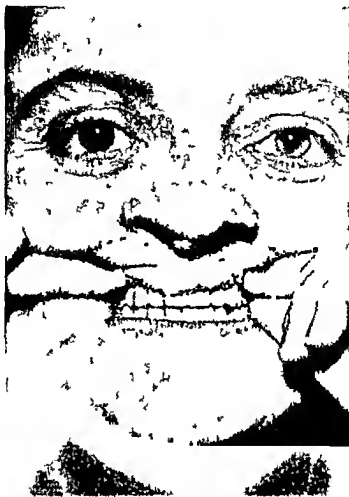
Fig 8 The final result gained by surgical mobilization of the lip and the insertion of a prosthetic appliance over the natural denture

retaining appliance The original tooth in this area was literally moved out of its retaining bone by the orthodontic repositioning An extra tooth on the right side between the cuspid and lateral incisor was placed to maintain contour and establish a continuous dental arch This case shows a good cosmetic result coupled with good functional relationship between the upper and lower jaw with almost a complete natural complement of teeth The premaxilla is still freely movable The point to be noted is that additional surgery might have given this patient a stable premaxilla but only at the expense of a failure of development of the middle third of the face

CASE 4

Fig. 13. Cephalometric tracings of a 19 year old female showing the minimal growth interference following inadequate sugery for closure of a unilateral cleft of lip and palate. The palate and lip were operated upon when the patient was 16 months of age but the palate opened *throughout its entire length* shortly thereafter. The lip was closed by skin and mucous membrane only, there being no evidence of muscle across the cleft. *It is assumed* that the surgery was so inadequate that there was only slight interference with the maxilla as shown by the faeial angle which is a −5°.

CASE 2

Fig. 14. The cephalometric tracings of a 4 year old male who had an extremely wide bilateral cleft of the lip and palate. There was little evidence of a columella or philtrum *on initial examination*. The lip was closed in two stages and the palate by apposition of soft tissue flaps only.

This child now exhibits a growth pattern within normal limits except for the *convexity* of the facial angle due to a prominent and anteriorly displaced premaxilla. This case is shown to emphasize the fact that growth was not distrubed by the surgery. The anterior displacement of the premaxilla was corrected *subsequently* by orthodontia.

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The tracings reveal that even with the central incisor of the appliance ⌐ ⌐⌐⌐⌐ the lower central incisors, the maxilla cannot be brought forward ⌐⌐⌐ ⌐⌐ ⌐⌐⌐ a good cosmetic result

Figure 10 shows the tooth arrangement of an 18 year old male who was ⌐⌐⌐ with a bilateral cleft of the lip and palate An early repair was made of ⌐⌐ ⌐⌐ only The premaxilla with its contained four anterior teeth is complete⌐⌐ ⌐⌐ from attachment with the maxilla Figure 11 shows the teeth of this ⌐⌐⌐⌐ ⌐⌐⌐⌐ eighteen months later The premaxilla and teeth have been repositioned ⌐⌐⌐ by orthodontic methods The left lateral incisor is attached to the p⌐⌐⌐⌐⌐⌐

Fig 8 The final result gained by surgical mobilization of the lip and the ⌐⌐⌐⌐⌐ ⌐⌐ prosthetic appliance over the natural denture

retaining appliance The original tooth in this area was literally m⌐⌐⌐ ⌐ its retaining bone by the orthodontic repositioning An extra tooth ⌐⌐⌐ ⌐ side between the cuspid and lateral incisor was placed to maintain ⌐⌐⌐⌐⌐ establish a continuous dental arch This case shows a good cosmetic re⌐⌐ with good functional relationship between the upper and lower jaw ⌐⌐ ⌐ a complete natural complement of teeth The premaxilla is still fixed ⌐ ⌐ The point to be noted is that additional surgery might have given⌐⌐⌐ ⌐ stable premaxilla but only at the expense of a failure of development ⌐⌐ ⌐ third of the face

FIG. 9. The tracing of this 16 year old male reveals the results of closure of a unilateral cleft of the palate at 15 months of age and the lip at 3 years of age. The benefits that could have been gained by closing the lip first and permitting it to act as a molding agent have been overlooked.

This tracing was made after extensive orthodontic treatment and after the insertion of a prosthetic appliance designed to increase the anteroposterior dimensions of the maxilla. The tracing shows that even with the central incisor of the prosthesis overriding the lower central incisors the desired facial configuration is not attained.

FIG. 10. Teeth of an 18 year old male with repair of bilateral cleft of lip but no surgery of the alveolar ridge or palate. There is complete freedom of the premaxilla in this case.

result has resulted.
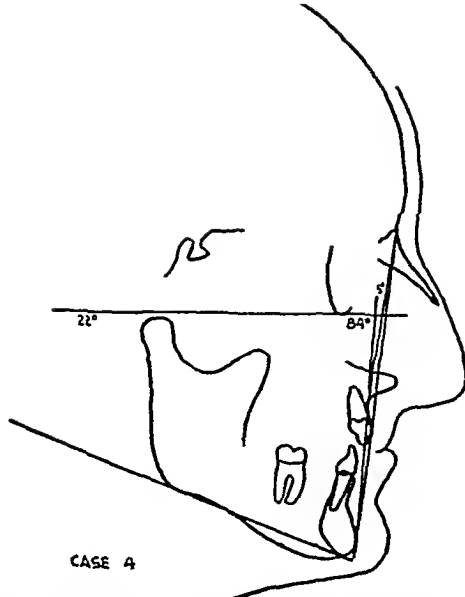
CASE 4

FIG. 13. Cephalometric tracings of a 19 year old female showing the minimal growth interference following inadequate sugery for closure of a unilateral cleft of lip and palate. The palate and lip were operated upon when the patient was 16 months of age but the palate opened throughout its entire length shortly thereafter. The lip was closed by skin and mucous membrane only, there being no evidence of muscle across the cleft. It is assumed that the surgery was so inadequate that there was only slight interference with the maxilla as shown by the facial angle which is a −5°.
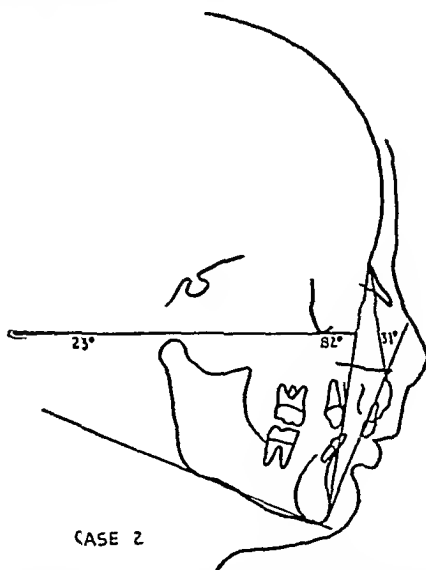
CASE 2

FIG. 14. The cephalometric tracings of a 4 year old male who had an extremely wide bilateral cleft of the lip and palate. There was little evidence of a columella or philtrum on initial examination. The lip was closed in two stages and the palate by apposition of soft tissue flaps only.

This child now exhibits a growth pattern within normal limits except for the convexity of the facial angle due to a prominent and anteriorly displaced premaxilla. This case is *shown to* emphasize the fact that growth was not distrubed by the surgery. The anterior displacement of the premaxilla was corrected subsequently by orthodontia.

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Figure 12 portrays the result of lip surgery alone. This individual was subjected to closure of a bilateral cleft lip in one stage. Cephalometric tracings revealed a mandible normal in form and size but a maxilla inhibited in its anteroposterior growth

In contrast to the previous three cases Figure 13 represents the tracing of a 19 year old female. She was born with a unilateral cleft of the lip and palate both

Fig 15 Case B K at 2 weeks of age. The premaxilla is displaced anteriorly and to the left

of which were repaired at 16 months. The lip was intact over the area of the cleft but the tissues were very thin because of inadequate apposition of muscle tissue. The palate showed little effect of the surgery except a scar along the edges of the cleft which was still open. There was some evidence of failure of growth in the region of the anterior maxillary spine but this was not marked. It was assumed that the surgery in this case had been so inadequate that it had not inter-

fered with the subsequent growth of the maxilla itself nor with that of the overlying soft tissues.

The following three cases indicate the possibilities of long term results when conservative measures are employed in the surgical management of cleft lip.

FIG. 16. The left side of the defect closed first.   After 4 months the left nostril is in fair position with the premaxilla approximating the maxillary ridge on the left side.   The lip has actually forced the premaxilla further out of line on the right side.

Figure 14 shows the tracings of a 4 year old male. This child had an extremely wide bilateral cleft of lip and palate. The lip was closed in two stages in order not to interfere with bone growth. At the time of the first operation there was little gross evidence of a philtrum or columella. The soft tissue closure in stages avoids much of the interference with bone growth. If the space between the cuspid and lateral incisors were closed, this child's general configuration could be within normal limits. However, if this space were to be forcefully closed, even

at this late date, additional damage to growth centers would result This space can easily be closed by orthodontic means, but even this must be carried out by one who is aware of the damage that can be done in this area by excessive original movement

Of
coli
developing a fairly normal facial pattern
he nose with a fairly normal philtrum and
the palate proper is closed

Figure 15 shows the condition of patient B K when first seen at 2 weeks of age The clefts were unusually wide and the premaxilla was markedly displaced anteriorly. The left side of the defect was closed first Figure 16 shows the child 4 months later and it will be noted that the premaxilla was further out of position on the unoperated side than was the case originally However, the floor of the nostril on the operated side is at approximately its normal level The right side was operated and the cleft closed shortly after this photograph was taken

Figure 17 shows the patient at 3 years of age and it will be noted that the nose and lip are symmetrical and the facial pattern seems quite normal. The teeth in the premaxilla have erupted to a normal level, permitting functional occlusion with the mandible and although the premaxilla is still completely detached it is in good relation to the two maxillae.

At no time during the surgical procedure was bone cut, fractured, or "molded". The contouring was accomplished by the lip tension that was created. The soft tissues were handled with the greatest care. Skin hooks (Fig. 18) were used

FIG. 18. Demonstrating the use of "skin hooks" to retract tissue in the second stage repair of bilateral cleft of the lip. No clamps or ties are used that might interfere with subsequent blood supply and eventual bone growth

rather than hemostats and no clamps of any type were employed that might damage the blood supply. The movement of the premaxilla was slow in this case but the distance it had to be moved was greater than usual.

In contrast to this is the case shown in Figure 19. This baby presented with a complete bilateral cleft of the lip and palate, with considerable tissue in the philtrum but with little demonstrable columella.

The total time elapsed between the photos represented in Figures 19 and 20 was 70 days. This child showed the fastest movement of the soft tissues and the premaxilla that has been seen in our clinic. The photo in Figure 20 was taken

two weeks after his second operation and already there had been much fading of the scar and improvement of the mucous membrane line.

This two-stage procedure demonstrates that closure can be effected without fracturing the maxilla or premaxilla and without "molding" or otherwise forcing tissue into position. The use of wires or retaining appliances cannot be condoned because their use violates anatomical and physiological principles.

Fig. 19. Infant D. G. 2 weeks of age with bilateral cleft of lip and palate.

DISCUSSION

The rehabilitation of the patient afflicted with cleft lip and/or cleft palate has, in the past, been too often the responsibility of individuals working independently. Thus the surgeon has considered his chief role to lie in the closure of the defect at as early a date as possible. The apposition of parts has been the end sought, even though it might necessitate repeated operations. He has been concerned primarily with the result at the time of operation and if the closure was

maintained and an immediate satisfactory cosmetic result achieved he has considered his work ended.

As the child approached school age its speech deviations were apt to become noticeable and the services of a speech teacher would be sought. This individual usually attempted to adapt the speech mechanism to deformed anatomy but in a number of cases the deformity proved too great and an orthodontist would be called to attempt correction of the mouth parts. This worker found such cases all but hopeless and, after weary years of effort, would watch his result collapse

FIG. 20. Infant D. G. 70 days after photo shown in Fig. 19.   This child's lip was closed in 2 stages.   Photo taken 2 weeks after the second operation   The rapid movement of the premaxilla into a fairly normal position was unusually rapid as compared with other similar cases.   The scar can be expected to improve.   No "molding", fracturing or forcing of bone was done at any time.

almost over night unless some permanent form of retaining device were worn. The wearing of such a device usually meant a breaking down of the teeth at the areas of retention which in turn meant extensive and expensive restorative dental work. All else failing, the prosthodontist came into the picture to construct an appliance that would, in some small measure, compensate for the deficiencies of the previous types of management.

Our concept of cooperation of specialists is one embodying all the above services plus those of the anesthetist and pediatrician but all operating as a group,

carrying out procedures only after all members of the team concerned with the child's welfare are aware of and approve of the steps to be taken

There have been some noteworthy exceptions to this general pattern of disjointed services, incidents where surgeon and prosthodontist, surgeon and orthodontist have worked harmoniously together, but even under these conditions the successful end results have been discouragingly few. The patient, all too frequently, had need for psychiatric care before he reached adulthood because of his awareness of his glaring inadequacies

Of recent date there have been signs of a dawning realization that better care could be given this type of patient under a system of interprofessional co-operation. Various centers have sprung up where the attempt has been made to bring the special skills of the several specialties together and focus them on the individual patient. In some cases the moving spirit has been the surgeon, in some the orthodontist, in some the prosthodontist and in some the speech therapist, but all have stressed the necessity of cooperation. This report is based on five years experience in such a center, one where all specialties contribute to the final result

But the cooperative approach to the problem is not of itself the final answer although it is a long step forward. The most skillful application of present day methods, regardless of how administered, still leaves too much to be desired in the average final result. Methods of the future must be based on different concepts than those that have governed this work in the past. Procedures must rest on a more solid foundation than the subjective judgments of single clinicians. Only intensive research will indicate the nature of improvements to be made. Because of the nature of the problem it will be necessary to observe and interpret results over a period of years. Fortunately, a considerable amount of such research has already been done and waits only to be applied

CONCLUSION

The evidence is already at hand that surgery can and does inhibit normal growth. This interference is directly proportional to the amount of injury to growth centers and to diminution of blood supply to the parts concerned. Other evidence is available to show that congenitally deformed parts, unless permanently damaged, grow at normal rates. These two findings alone should cause us to examine our concepts and procedures very carefully. Together they indicate that surgery poorly executed or poorly timed, can do more damage than good in the long run

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BLOOD LOSS IN INFANT CLEFT LIP AND CLEFT PALATE SURGERY

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Numerous authorities have estimated that blood loss of 20% of the total circulating volume predisposes to surgical shock during the course of surgery or in the immediate postoperative period if replacement therapy is not instituted Lesser losses, even though they do not approach the shock producing levels, undoubtedly influence the postoperative course both from the standpoint of general recovery and healing of the operative site The preoperative estimation of possible blood loss and the actual evaluation of the loss during the course of surgery influence the judgment of the surgeon regarding the immediate and late replacement of lost blood volume. It may be assumed then that methods for the conservation and replacement of blood volume contribute directly to better surgical end results

Table 1 demonstrates the extreme significance of losses of small amounts of blood in infant patients Blood volume loss approaching dangerous or shock levels may be unnoticed unless carefully measured or estimated

For many years the authors have empirically used vasoconstrictors in an attempt to diminish the loss of blood during operative procedures on cleft lip and cleft palate patients A method was devised and is presented here to demonstrate the advisability of this procedure

Average blood loss in various types of surgical procedures has been reported by other observers (1, 2, 3) These studies have made surgeons generally more conscious of blood loss and have helped rationalize replacement therapy

Operative blood loss in a series of infant patients with congenital cleft lip and cleft palate deformities was studied in an attempt to determine the average percentage of total circulating volume loss One group was operated after local infiltration of tissues in the operative area with procaine containing a vasoconstrictor drug A control group was operated without the use of the local anesthetic vasoconstricting drugs The quantity of the vasoconstrictor was intended to be kept as small as would permit evaluation of the drug All cases in which the vasoconstrictor was used were injected with a solution prepared at the operating table by the addition of 15 drops of 1 : 1000 solution of epinephrine delivered from a 23 gauge needle into 100 cc of 1 5% procaine This gave an estimated dilution of epinephrine in procaine of 1:285,000 A period of 10 minutes was permitted to elapse after injecting before beginning surgery

The following usual standard methods of hemorrhage control were employed in all cases digital pressure, Blair lip clamps, hemostats applied to evident bleeders, and epinephrine soaked gauze packs as indicated

Estimated blood volumes were determined after the method of Robinow and Hamilton (5). A standard of 90 cc. of blood per kilogram of body weight was chosen in order to allow comparison between all groups studied. It is recognized that the infant group probably has a slightly higher blood volume than this while the "toddler" group may have a slightly lower volume. This gives the advantage to the group most needing it.

The blood loss was evaluated after the method of Gatch and Little (4) with modifications. All soiled sponges were placed in a bottle of distilled water, and

TABLE 1

*Relationship of blood loss to total blood volume**

WEIGHT	TOTAL BLOOD VOLUME	100 CC. LOSS
lbs	*cc.*	*%*
10	450	22.0
20	890	11.0
40	1,600	6.2
80	2,825	3.6
140	5,000	2.0
200	7,000	1.4

* This chart is from Coller, F. A., Crook, C. E., and Iob, Vivian: Blood Loss in Surgical Operations. J. A. M. A. 126: 1-5, (Sept. 2) 1944 who further credited Robinow and Hamilton (Blood Volume and Extracellular Fluid Volume of Infants and Children: Studies with Improved Dye Micromethod for Determination of Blood Volume, Am. J. Dis. Child. 60: 827 (Oct.) 1940 and Gibson, J. G., 2nd and Evans, K. A., Jr.: Clinical Studies of Blood Volume: Relation of Plasma and Total Blood Volume to Venous Pressure, Blood Velocity Rate, Physical Measurements, Age and Sex in Ninety Normal Humans. J. Clin. Investigation 16: 317. 1937.

TABLE 2

Relationship of vasoconstricting agent to total solution volume
Parts of Constricting Agent—epinephrine 1:1000

Drops from 23 gauge needle
75 drops per 100 cc = 1/57,000
60 drops per 100 cc = 1/72,000
15 drops per 100 cc = 1/285,000

all suction fluid and washings from instruments and gloves were saved. The use of a sterile water proof draw sheet over the patient that could be washed after operation obviated the difficulties of extracting blood from soiled linen. The hemoglobin of the total washings was converted to oxyhemoglobin after suitable dilution and read in the photoelectric colorimeter after the method of Evelyn (3). The hemoglobin content was estimated from the standard curve and compared with the hemoglobin content of the patient's blood withdrawn before operation.

The accuracy of this method (3) is known to be approximately 95 to 99 percent in cases with larger blood losses but it is felt that with the small quantities

handled, greater care at the operating table and with no linen involved, the results should be at least within the same accuracy range if not somewhat better

The patients in this series were considered good operative risks They were

TABLE 3

Cleft lip—operative blood loss

OPERATION	NO OF CASES	AMT LOCAL ANESTH SOLUTION*	AV WEIGHT	AV OPER TIME	AV EST CIRCULATING BLOOD VO	AV EST BLOOD LOSS	AV % OF TOTAL VOL LOST
		cc	Kg	*min*	*cc*	*cc*	*cc*
Cheilorrhaphy							
Unilateral incomplete	3	None	7 2	68	648	30 4	4 6
Cleft Lip	6	6 0	4 2	68	378	16 0	4 2
Cheilorrhaphy							
Unilateral complete	2	None	3 5	77	315	23 0	7 3
Cleft Lip	4	4 9	3 2	65	288	7 9	2 7
Cheilorrhaphy							
Bilateral complete	3	None	4 4	70	396	52 7	13 2
Cleft Lip	3	6 5	3 6	74	324	31 8	9 8

* Local anesthetic—1 5% procaine with 1 255 000 epinephrine

TABLE 4

Cleft palate—operative blood loss

OPERATION	NO OF CASES	AMT LOCAL ANEST* SOL	AV WEIGHT	AV OPER TIME	AV EST BLOOD VOL	AV EST BLOOD LOSS	AV % OF TOTAL BLOOD LOST
		cc	*kgm*	*min*	*cc*	*cc*	
Palatorrhaphy							
First Stage	4	None	10 8	35	972	47	4 8
	3	2 6	11 7	63	1053	37 2	3 5
Palatorrhaphy							
Second Stage	2	None	12	63	1080	70 9	6 5
	6	6 0	11 2	66	1008	37 4	3 7
Palatorrhaphy							
Push back	3	None	11 4	70	1296	63 8	4 9
	7	4 7	14 2	72	1282	55 1	4 2

* Local anesthetic solution—1 5% procaine with 1 285,000 epinephrine

evaluated by the Department of Pediatrics and presented no contraindications to elective surgery

The weight range in this group was from 2 5 kilograms to 9 2 kilograms for the cleft lip patients while the cleft palate patients ranged from 7 6 kilograms to 20 1 kilograms The youngest cleft lip patient was 22 days and the oldest 293 days The cleft palate cases ranged from 13 months to 84 months

Table 3 contrasts the results of measuring blood lost at operatin in cheilor-rhaphies and Table 4 in palatorrhaphies—both with and without the use of a vasoconstricting drug. The losses in incomplete cleft lip are somewhat higher than those of the complete cleft lip group, probably on the basis of greater blood volumes in the former. The urgency of operation is often not as great in the incomplete group and they usually come to operation when they are older. Otherwise, the loss is shown to parallel the extensiveness of the operation.

The values shown by this study indicate only the degree of hemostasis obtainable by the use of low concentrations of epinephrine. Higher concentrations up to 1:75,000 should give greater hemostasis and lower percentage blood volume loss. The blood loss from bilateral cleft lip surgery without the use of vasoconstrictor elements does approach shock levels and gives a narrow margin of safety. In no instance, however, did one of our cases show evidence of postoperative shock. In no other procedure in this series did the percentage blood volume loss approach a significant level.

Healing in all instances was uncomplicated and showed no apparent variation with or without the use of the vasoconstrictor solutions. No case of delayed hemorrhage was noted.

Local anesthetic solutions with epinephrine beside their vasoconstrictor value enable the anesthetist to carry the patient on a surgical plane of anesthesia with a minimum of general anesthetic drug, thus promoting the safety of the patient during operation and minimizing the possibility of postoperative anesthetic complications.

SUMMARY

1. A method of measurement is presented for evaluation of blood loss in cleft lip and cleft palate surgery.

2. Evidence is presented to show that blood loss is not excessive in these operations if the usual methods for the production of hemostasis are followed. In the instance of the bilateral cheilorrhaphy blood loss does approach dangerous levels.

3. There is indication that the addition of a vasoconstricting agent even in very small concentrations is valuable in further reducing blood loss.

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RESTORATION OF MAJOR DEFECTS OF THE ARM BY COMBINATION OF PLASTIC, ORTHOPEDIC AND NEUROLOGIC SURGICAL PROCEDURES

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Compound injuries of the arm that cause wide loss of soft tissues and bone leave extensive, crippling defects Dense fibrous tissue fills in gaps, fixes and distorts joints, and prevents normal surface healing There is not an adequate minute blood supply possible in this woody fibrous tissue to maintain nutrition even for the scar epithelium that tries to heal the surface, and it may continually break down on the slightest trauma or even spontaneously There is the same small chance of proper union or alignment of the bone fragments when they are surrounded or covered by this dense avascular scar tissue, which seems to be the only way nature has of trying to heal these wounds It proves successful in many soft areas that can collapse to a large extent But where important nerve supply has to get through, or where the normal support (or armature) of a long bone has to be restored for proper function, this scar healing may not suffice

To obtain relief from this binding, distorting scar, with surface ulceration and deep fixation of bone, joints, tendons and nerves, there needs to be first, removal of the scar and replacement by gentle dissection of surrounding normal soft parts and bones to approximately their normal position Then there needs to be repair of the resultant defect with normal soft tissue of fat and skin covering

For these defects in hand, forearm, and arm, there is nearly always a satisfactory nearby donor site on the abdominal and chest wall The extremity can easily accommodate itself to the trunk, and in turn the trunk can supply almost any design of flap

The principle of a short broad pedicle can be used in nearly all instances so that direct flaps can be taken up and used immediately Thus the scar can be dissected, the flap raised and applied in a single operation The bed or donor site can be grafted at this time also, so that practically a closed wound may result It is not necessary to do this closure at the original operation if contra indicated for any reason, as the donor site can be kept clean enough not to interfere with the take of the flap or with the deep wound

In 14–21 days the short broad pedicle can be completely severed, or it can be severed in stages, and the edges can be put down in place, both on the injured site and on the donor site, at this same time or later. In this way very large areas

FIG. 1 (*A* and *B*).—Extensive compound injury and loss of tissue repaired with direct flap from chest and back.
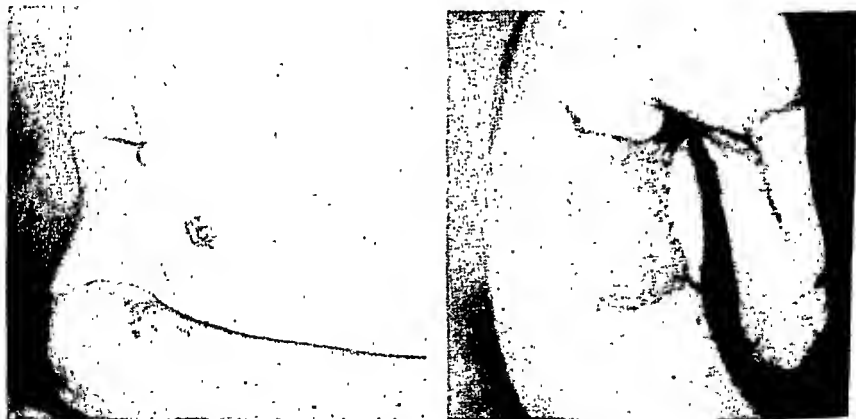
FIG. 2 (*A* and *B*).—View of direct pedicle with wound closed with split grafts. Completed in 21 days; one operation on and one off.

of damage, including almost a whole forearm, can be dissected and be on and off the abdomen within 21 days. It is not necessary to use tubed, or tunnel, or double pedicle, or delayed flaps when this short, broad pedicle method can be followed out. The operative work at one sitting is longer and perhaps more tedious but

the benefit to the patient and the saving of multiple operations and many patient-hospital-weeks is of great advantage, and the total amount of work is much less.

When the flap is in place and there is no swelling or infection, and several weeks have elapsed for thorough establishment of blood supply, any deep work can be done on bone, tendon, joint, or nerve. Approach can be made through the flap or along an edge if too much is not turned back on a pedicle of another scar edge.

The essential point is that normal soft tissue is supplied to replace the dense scar, so that deep work can be done and so the overlying wound will heal. As

FIG. 3 (*A* and *B*).—Total loss of part of humerus with successful dual bone graft put in through the flap by Dr. Walter Graham Useful arm obtained

has been said in several previous publications (1-9)L "the deep healing can be no better than the surface healing."

To start putting in the outside of a repair first, that is the flap, and then to put in the bone might seem to be working backward and not like any other mechanical construction in which the support or armature would be constructed first and then the walls built around it. But these fundamental ideas are important to recognize in the over-all approach to the problem.

This method was used and reported before the war, but military plastic surgery supplied thousands of instances for successfully carrying out the method. It was found, too, that very early application of the flaps hastened deep healing and bone union. The first direct flap that had been used many years before the war was on a gunshot wound of the hand, just eight days after the injury and in an instance where amputation had been recommended.

One criterion for saving arms is that if the nerves are intact every effort

should be made, even if amputation has to be done later. Besides this, however, when nerves are lost, if the circulation will survive then flaps should be done to give a chance for nerve dissection and repair, or tendon substitutions.

In this simple, direct method of skin and soft tissue replacement is found one of the most useful plastic surgical procedures, and in the combination of plastic and orthopedic and neurological surgical work, many seriously damaged hands and arms have been saved.

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DERMAL GRAFTS FOR CORRECTION OF FACIAL DEFECTS
(A Series of 80 Cases)

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In search of "fill in material", for the correction of facial contour deformities, the plastic surgeon has attempted the use of tissue transplants obtained from various sources The autogenous source has furnished him with the following tissue transplants bone, cartilage, fascia, derma, fat fascia, fat and skin

His attempts in the utilization of isografts have been somewhat less productive Up to the present time, cartilage has been one of the most successful of those tissue transplants, resulting in the now commonly used cartilage banks So far, heterografts (zoografts) have been considered as totally useless, but there is a new interest and new trend toward further experimentation in that direction

In passing, it should be mentioned that the plastic surgeon in search of "fill in material", has invaded the inorganic field, with the result that various materials have been used with varying degrees of success Metals and their alloys, acrylic compounds (1) paraffin and mineral oil, are among the common ones that have been tried Alloplastic transplants, as a rule, are contra indicated as supporting structures (2)

The purpose of presenting this series of eighty dermal grafts is to emphasize the following points

1. Dermal grafts have gained a definite place among the armamentarium of the plastic surgeon, for the reconstruction of facial contours

2 Dermal grafts, free of any subcutaneous fat, tend to show an increase in volume in the early post operative period, due to show the vascularization of the graft, and later on, show a decrease from the original volume (approximately 15%), due to absorption

3 Of the eighty dermal grafts, only 7 5% show complications and only 1 25% of these show epidermoid cyst formation

HISTORY OF DERMAL GRAFTS

Among the soft tissue grafts for "fill in material", the dermal graft (cutis graft) was first introduced by Eitner (3) in the early twenties Since then, the literature on dermal grafts has kept pace with any literature on autogenous grafts for that purpose

Straastma (4) introduced the use of dermal graft in repair of saddle defects of the nose Nicholas (5) suggested that the retention cysts were due to implantation of cutaneous tissue appendages during surgery, or due to their implantation during hypodermic injections Peer (6) studied the fate of buried skin grafts in man through microscopical sections removed at intervals varying from two weeks

to twenty-eight months, and concluded that the implantation theory of cyst formation in man is doubtful. King (7), Wein (8), as quoted by Bunnell (9) and Yachnin (10), stress the fact that epidermoid cysts, also known as implantation cysts, are commonly found on the flexor surfaces of the fingers and hands among manual workers, and are invariably associated with a history of trauma. The occurrence of these epidermoid cysts in the post-operative and traumatic cicatrices tends also to favor the implantation theory.

<div align="center">TOPOLOGY OF SKIN</div>

A brief review of the anatomy of the skin is of valuable aid in appreciating the concept for the indications and contra-indications for dermal graft and in selecting its donor site. The thickness of the skin all over the body varies from 1.5 to 5.0 mm, depending on the age, sex and race of the individual, and also upon the location of the skin. The younger the individual, the thinner the skin. Excluding the palms of the hands and the soles of the feet, the back offers the thickest skin, while the genitalia and the eyelids offer the thinnest skin.

The hair-free areas of the skin inside the thighs, abdomen and back, offer the best donor sites for dermal grafts.

<div align="center">HISTOLOGY</div>

Embryologically the skin is derived from two layers. The epidermis (scarfskin, cuticle, or the outer layer) is derived from the ectoderm, while the dermis (derma, derm, corium, cuta vera, true skin, or the deeper layer), is mesodermal in origin. The epidermis is made up entirely of epithelium, divided into five layers (stratum corneum, stratum lucidum, stratum granulosum, stratum mucosum and stratum germinativum).

The dermis consists of three layers and varies from 1.0 to 2.0 mm in thickness. The outer layer (pars papillaris) projects within the epidermis. The white fibrous and the yellow elastic connective tissue cells predominate, and they phagocytose melanin from the epidermal cells. The middle layer (pars reticularis), the leather of the skin is mainly white and yellow elastic fibrils. The coils of the sweat glands terminate in this layer (11). The inner or the subcutaneous areolar layer is composed of loosely arranged connective tissue. It serves as a buffer against trauma and also as a matrix for blood vessels, lymphatics, nerves, hair follicles and some sweat glands.

The appendages of the skin, namely the hair follicles and some sweat glands, reach into this deeper layer—the derma. The epithelial elements of these structures are responsible for the regenerative powers of the donor site following the excising of split thickness grafts, without which histological feature of the skin, the present day application of skin grafting would be impossible. The rich vascular anastomosis is in the deepest layer of the derma. The vertical branching of the blood-vessels offers an abundant source for the capillary endothelial proliferation in the early vascularization between host and graft

INDICATIONS AND CONTRA-INDICATIONS FOR DERMAL GRAFTS

Wherever there is a deficiency in contour, with normal skin and a good vascular bed below the skin, be it on the face, nose, or forehead, and provided there is no demand on the part of the vital underlying structures such as brain tissue, for protection from trauma, the dermal graft can be used safely

As in any other graft—asepsis plays a vital role in the dermal graft Any in active or dormant dermatological pathology of the appendages of the skin (trichosis, dermatitis, sebaceous cysts) of the proposed donor site may be exacerbated by the operative trauma which in turn spells the failure of the graft or causes a delay in the healing of the donor site, and affects the final outcome of the dermal graft

The dermal graft cannot survive in an avascular recipient bed, therefore, all of the scar should be removed There should be adequate skin coverage with sufficient subcutaneous vascular tissue, the latter being necessary for supplying the required nourishment for the dermal graft

ADVANTAGES AND DISADVANTAGES

The dermal graft when used for "fill-in material" of soft tissue defect, has the advantage over the cartilaginous graft, of being soft and pliable, and when accepted by the tissues, is indistinguishable from the local soft tissues The source for the dermal graft is abundant The taking of the dermal graft is simple and easy in its technique This is true both for the operator and for the patient It is not followed by any great complication as commonly seen in the autogenous cartilage graft, such as infection, mobility and curving of the graft

The dermal graft is superior to free fat-fascia graft, since the former shows a uniformly constant degree of absorption, which in our hands is approximately 15%, while in the hands of one of the authors, the free fat fascia graft absorption varies from 30-100%, depending on the ratio of fat to fascia

The incidence of infection is also greater in the free fat-fascia graft than in the dermal graft Infection (follicular in origin) and cyst formation (from remnants of sebaceous glands in derma) have been the two major objections to the use of dermal grafts Some of the reports estimate the incidence of infection as high as 15% Opposing this is the fact that the 21 hour preparation of the skin has reduced the percentage of infections Here again, as in any surgical undertaking, the intelligent application of the common surgical principles and the careful review and consideration of the indications for surgery should precede any actual surgery. Skin infections and dormant dermatological conditions, local or distant, should be treated and eliminated prior to surgery Chemotherapy and biologicals have further reduced the incidence of infection

The second common objection to the use of dermal grafts has been the occurrence of cyst formations It has been reported that the incidence of cyst formation in dermal grafts is 5% Following in tabulated form are the encountered complications in our series of 80 dermal grafts

Series of 80 dermal grafts

NO. CASES	NATURE OF COMPLICATIONS	PER CENT
2	Inadequate skin coverage of recipient site	2.5
1	Sebaceous cyst formation in dermal graft	1.25
1	Necrosis of dermal graft	1.25
1	Hematoma in recipient site	1.25
1	Infection of recipient site and graft	1.25
6	Total number of complications	7.5

If the defect is too extensive thereby requiring a large amount of derma for its correction and thus making it necessary to fold or roll the derma several times or to pyramid it in more than four layers, the authors feel that the correction should be attempted in two stages in order to reduce the possibility of necrosis of the graft from lack of opportunity for vascularization.

TECHNIQUES OF OBTAINING DERMAL GRAFTS

The original Loewe (12, 13) method of obtaining derma consisted of scraping the epidermis and then the derma was dissected free hand. Rehn (14) improved on it by removing the epidermis as a Thirsch graft and later on, returning the graft to the donor site. In 1943 Swenson and Harkins (15) removed the epidermis with a dermatome. Seola (16) in 1944 cut full thickness skin graft 40–50/1000 inch, then reapplied fresh glue to the dermatome and shaved the epidermis 8/1000 of one inch which he used for grafting the donor area. The Split-Split Method of obtaining the derma was introduced by Zintel (17) in 1945. By this method a full thickness graft was obtained with the dermatome (40–50/1000 of one inch) and then the dermatome was reset and the desired thickness of epidermis was recut on the dermatome.

Of all the methods, Zintel's Split-Split Method offers the fastest and most uniform, due to the use of a precision instrument. With its intelligent use, an excellent dermal graft can be obtained.

The authors have employed the following two methods of obtaining and inserting the dermal graft:

First method

1. The amount of dermal graft needed for the correction of the deformity is determined.

2. A split thickness skin graft of the predetermined size is removed with the dermatome.

3. The required dermal graft is dissected free hand and the donor area skin grafted with the split thickness skin graft.

4. The recipient area is incised, undermined and haemostasis controlled.

5. The derma is then packed as one piece or as a strip, overcorrecting the deficiency by 15%.

6. The wound is closed and a pressure dressing applied (Figs. 1, 2, 3, 4, 5, 6).

Fig 1 Deformity of Left Upper Lid

Fig 2 Post Operative View of Dermal Graft—Left Upper Lid

FIG 3 PRE-OPERATIVE VIEW OF DEFECT—RIGHT CHEEK

FIG. 4. POST-OPERATIVE VIEW—DERMAL GRAFT

Fig 5 Pre Operative View of Depressed Dorsum of Nose

Fig 6 Post Operative View Following Dermal Graft

Fig. 7. Antero-lateral view—showing deformity left side of face, following compound, comminuted fracture of left mandible, as a result of a shell fragment wound. The mandible was bone grafted 18 months previously.
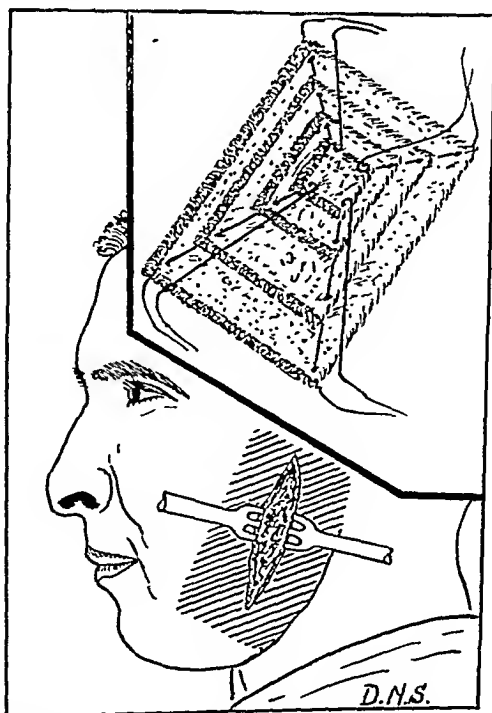
Fig. 8. Diagram showing extent of undermining of recipient site, and in insert—the pyramided dermal graft.

Fig 9 View of corrected defect—fifth post operative day, showing retention sutures or dermal graft) tied over porcelain buttons

Second method

1. Same as step one in method above.

2. A full thickness skin graft of the required dimensions is cut from the hair-free portion of the body with the dermatome set at 40–55/1000 of one inch depending on the donor site.

3. The dermatome is reset at 12/1000 of an inch and the derma is cut off from the graft while the full thickness skin is still on the drum.

4. The split thickness skin graft is used to skin graft the donor site.

5. The defect of the recipient area is then outlined and the necessary correction as to its amount and location is then determined.

6. The recipient area is then incised preferably in its midportion, and the skin margins are undermined, but not beyond the extent of the deformity.

7. Haemostasis (18) is controlled with white cotton No. 80 (19, 20).

8. The dermal graft is cut in sections which are pyramided to correspond to the extent, amount and location of the required correction. Most of the defects are concave in nature and have a portion which represents the maximum loss of tissue (maximum depression), while the periphery of the defect tapers off within the normal contour. For that reason, the pyramided dermal graft is here introduced, allowing a graduated correction corresponding to this type of defect. The pyramiding of the graft is accomplished by placing three or four layers of derma on top of each other, each layer being smaller than the preceding one, thus permitting the vascularization of every portion of the graft (Fig. 8).

9. The graft is immobilized externally under normal tension, the long sutures being tied over porcelain buttons (Fig. 9), which sutures are removed on the 5th post-operative day.

10. The wound is closed and a firm pressure dressing applied.

SUMMARY

The historical data on dermal graft, the anatomy, embryology and histology of the skin are reviewed. Indications and contra-indications for dermal grafts, and also their advantages and disadvantages are outlined. Two techniques of obtaining dermal graft are described. A series of 80 dermal grafts is presented with their causes and percentage of complication (7.5%) tabulated, of which 1.25% were due to infection and 1.25% revealed cyst formation.

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GIGANTOMASTIA

The Two-Stage Operation for Reduction of Extremely Large Breasts vs. the One-Stage Technique

H. O. BAMES, M.D., F.A.C.S., F.I.C.S.

Los Angeles, California

In a recently published paper "Reduction of Massive Breast Hypertrophy",[1] we outlined our technique of reduction of large breasts. That technique is safely applicable to breasts which are not more than two to three times larger than would appear proportionate to the individual's general body build. More than 90% of patients seeking reduction of their hypertrophied breasts fall into this category.

Since publication of the above paper, however, many queries have been received in regard to treatment of breasts which exceed the above limitations in size, that is, for extreme hypertrophy, gigantomastia. Why is the same technique not applicable here also? The answer given by practical experience is: potential necrosis. Complete necrosis is, of course, a major catastrophe, but even when occurring in the smallest degree, necrosis detracts from what otherwise would have been very gratifying results. Therefore, the avoidance of such a serious complication deserves our most careful consideration.

Factors responsible for necrosis are: histological composition, size of mass, and manipulation of tissues during surgery.

Moderately large breasts vary in composition from almost pure fat with only infantile glandular development, to mixed fibroglandular, or to almost pure fibrous structure. The larger the breast, the more likely it is to be composed of fat only. Fatty tissue has a relatively scant circulation, the vessels being small and easily bruised. A large block of tissue may undergo ischemic necrosis from interference with but a small sector of its circulation. Fibrous or fibroglandular tissue has a more diffuse and better protected circulation within its trabeculae. The vessels are not so readily bruised, and even if injured, will recover more rapidly or promptly anastomose, very much as takes place in the formation of pedicle grafts. Hence the deduction that the more the mass is composed of fat only, the more care we must exercise in limiting the size of the resection, which, arbitrarily, should never be more than one-half the mass. On the other hand, if the mass is largely fibroglandular, we can extend our limitation, and resect as much as two-thirds of the mass with relative safety to the remainder. To determine cellular composition preoperatively we depend upon palpation; homogenous smoothness suggests fatty tissue; fibrous tissue has a firm trabecular feel. This, however, is only a leading suggestion, not an infallible test.

Next to cellular composition the factor to be considered is the size of the breast

itself Obviously, the displaced nipple and gland must be returned to their normal locus for a satisfactory result If the continuity of tissue between basic attachment on the chest wall and the nipple is to be maintained, this replacement can only be accomplished by plication or by circle formation of an elongated pedicle

This pedicle is that part of the mass remaining after ablation of all the other redundant tissue, its base being attached to the chest wall with its free end carrying the areola and nipple The longer the pedicle is, the wider and fuller it must be in order to carry enough blood vessels to nourish the tip

Now, while in a mechanical sense, enough uncut vascular tissue is thus maintained, the very act of reshaping the pedicle by either plication or circle formation can, because of excessive manipulation, compression, torsion of vessels and thrombosis, destroy the function of many of these vessels as effectively as if they had been severed

A consideration of these factors brought into vogue the two stage procedure of mammaplasty The plan for a two stage procedure, though varying slightly with different surgeons, is one in which the first operative step consists of transplantation of the nipple, areola and part or all of the gland to their new location, with enough pedicle of undisturbed circulation to insure the safety of the transfer Then, a second operative step at a later time removes whatever tissue is still present in excess, and reshapes the remainder to a sculpturally acceptable form

Experience proved the wisdom of the above procedure for it practically eliminated the danger of necrosis Moreover, it revealed two other factors for consideration First, no patient likes to be operated on twice if it can be avoided, and hence, many patients failed to submit themselves to the second stage

This viewpoint on the part of the patient is understandable, since after being fully relieved of the physical handicap due to the burdensome masses she is willing to put up with an esthetically unsatisfactory result, as long as the reduced breasts can be supported properly in a well fitting brassiere Second, from the sculptural viewpoint there is another factor that may make a second step mad visible, namely, that an esthetically well formed breast may not be attainable by this or even by addition al corrective steps A mass composed largely of fibrous tissue can be shaped and fitted with considerable promise that it will maintain its form No such promise holds good for the purely fatty breast It may be possible to fashion a conical shape at the time of operation, but having blubbery rather than solid composition, it will soon flatten out, so that while physical distress has been fully relieved, psychological satisfaction may not be attainable by additional surgery

Of all known procedures for the relief of physical distress caused by very large breasts, the simplest and most effective one would be complete amputation This amounts to mutilation, and hence leads to permanent psychological dissatisfaction However, if a modified form of amputation were employed, leaving to the remainder of the breast a form and shape suggesting normalcy while confined in a brassiere, it would help to avoid the sense of mutilation to some ex

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[1] Plastic and Reconstructive Surgery, **3**: 560–569, September, 1948.

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tent. If, in addition, an areola and nipple could be implanted upon such a shape, the result would be a vast physical and psychological improvement.

The work of Thorek, Adams, Webster and others, in transplanting the areola as a free graft to its appropriate locus, and amputating the large pendulous portion in one clean sweep, pointed the way to such a one-stage correction. Arguments against this method were many, ably led by Maliniak, who condemns this procedure as absolutely unphysiological, in that the nursing function would be hopelessly destroyed, both by disruption of the lactating vessels, as well as by the destruction of the nerve supply to the nipple, which would make erectibility for nursing an impossibility. On purely theoretical grounds his position is unassailable. Let's be quite frank about this nursing aspect. It is common knowledge that a large breast seldom is a good nursing breast, and that the larger the breast, the poorer it is in that respect, so that in the very large breast there is no lactogenesis possible for practical purposes. How then can we seriously speak of surgical disruption of a function which was never even possible before surgery?

Pathological examination of very large breasts reveals almost uniformly an infantile gland surrounded by a mixture of fibrous tissue and fat, with hardly any glandular elements. The relief sought by the patient is freedom from the weight and disfigurement caused by two gigantic benign tumors, hoping also that plastic realignment of the unresected portion will shape it so that it approaches the considered "normal" for her body. Most of these very large deformities do not occur in women of the early childbearing period, the twenties or early thirties, but rather at a later age when childbearing and nursing is distinctly no longer desirable or possible.

Of what then are we depriving this woman by free nipple and areola transplant? Nothing presumably, except erotic sensation in the nipple. Evaluation of such sensation is difficult; it differs widely even in the normal breast. Also, this sensation diminishes with advancing years and is superseded by just the ordinary sensibilities of the skin. Such ordinary sensation is redeveloped in the transplanted areola in the same way as it is in other free transplants of skin. Even some muscular contractility in the transplanted nipple has been observed, when enough muscular tissue was left in the areolar graft to be capable of reactivation.

ABOLISHMENT OF THE TWO-STAGE PROCEDURE

Realizing that much can be gained by avoiding a second stage operation, and essentially nothing is lost in the free areolar transplant method, it is time to abolish the two-stage procedure in favor of the single stage free nipple transplant. There remains but to describe a technique, the results of which will most closely approach our ideal of the normal breast in visual resemblance, size, shape and position. Giving full credit to all those who have preceded or accompanied me in this approach to the problem, I herewith describe my own technique.

Designing of the pattern of skin incision lines is precisely as outlined in my previous paper quoted above (Figs. 1 and 2). Ablation of the areola and nipple, however, is intradermic and not subdermic, as is also the ablation of the new

areolar locus. The areolar graft is sutured in its new bed along its periphery and its more central portion is "quilted" on to its bed.

The customary manner of holding a pressure dressing in place is by tying some heavier sutures from the peripheral wound margins over the dressing I personally prefer another method of holding the pressure dressing in place because, theoretically at least, it applies pressure to the graft from the surface as well as from the deep tissue layers, and practically, it spreads this pressure over a larger area, thus effecting better immobilization of the areolar transplant. This method allows each heavy suture to enter the skin about one-half inch outside of the periphery
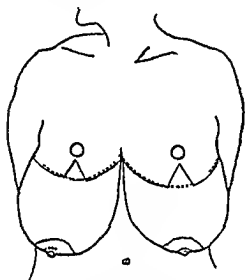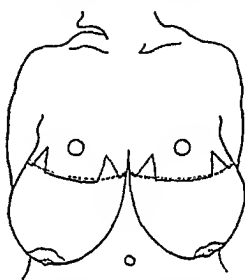
FIG 1   FIG 2

THE DESIGN FOR INCISIONS AND RESECTION IN GIGANTOMASTIA

FIG 1. The reduction in size of the areolae and their new sites are indicated   Solid curved transverse lines indicate skin incisions on anterior surface of breasts for the creation of the new lower borders, dotted lines show their parallel on posterior aspects of both

more normal and conical contour.

intact the circulation of the recipient area

of the implant bed, pass under the bed in the superficial fascia, and emerge at the opposite pole, again one-half inch to the outside. Some four to six sutures are so placed and tied over the pressure dressing. This dressing may be mechanics' waste, as advocated by some, sea-sponge, as advocated by others, or just ordinary fluff gauze. A single layer of gauze dipped in Furacin or Xeroform ointment is placed on the graft itself. This dressing is left undisturbed for ten days, only protective dressings are needed after that period for another ten days

The lower redundant breast mass is amputated in a clean cut between anterior and posterior lower border lines as previously designed. Lateral spread of the

FIGURE 3

Gigantomastia in a 65 year old patient which incapacitated her for a needed gainful occupation. The tremendous weight of her breasts was the source of much physical and mental suffering.
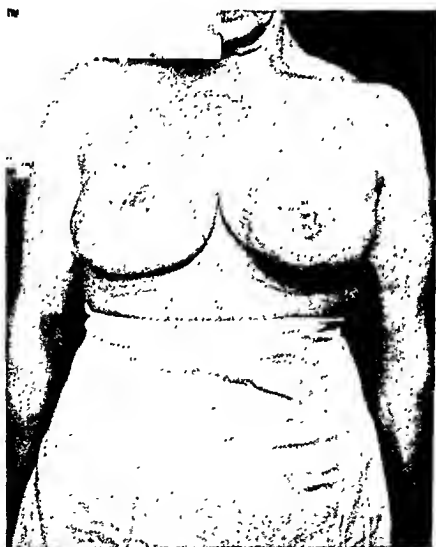
FIGURE 4

Results three months after the single stage operation described here with free transplantation of nipple and part of areola. Photograph taken at this early stage to show the scars and early result of the medial and lateral "V" resections.

remainder is corrected by additional "V" resection as outlined in the previous paper, but the apex of the "V" must not quite approach the site of the new areolar transplant in order to assure that the circulation of this transplant bed is left undisturbed. If the lateral spread is very wide, two "V" resections medial
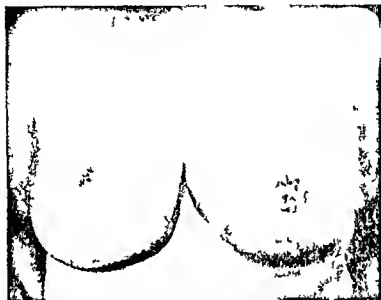
FIGURE 5

Close up of both breasts showing the satisfactory breast contour and areola transplant as well as the fading scars five months after surgery

FIGURE 6

Lateral close up five months after surgery showing the normal contour of the reduced breast, the perfect "take" of nipple and areola transplant and the elimination of lateral spread by the lateral "V" resection

and lateral to the areola may be more effective in creating a more conical contour. Mattress sutures are placed in the fascial layers for better approximation and to relieve tension on the skin edges. The skin is closed in the customary manner. Figs 3, 4, 5 and 6 illustrate a case treated by this method.

SUMMARY

1. Reasons for adoption and use of the two-stage operation for reduction of massive breasts are given, calling attention to the disadvantages of such a procedure.

2. Disadvantages of total amputation are explained.

3. Advantages of free nipple and areola transplantation in one-stage operation and disadvantages objected to by others are evaluated in favor of one-stage procedure for the reduction of extremely large breasts, gigantomastia.

4. The technique of this method is outlined.

EVALUATION OF PRINCIPAL MAMMAPLASTIC PROCEDURES

JACQUES W. MALINIAC, M.D.

Although reparative surgery on the deformed breast has been extensively dis cussed in the medical literature in the past quarter of a century, there is little to guide the surgeon in his choice of methods. Many procedures are described with out a supporting report of the number of cases in which they have been used and the results obtained. There is no basis for critical appraisal. As a result, safe and effective technics are sometimes ignored in favor of methods which disregard fundamental anatomical and physiological requirements.

To some extent this lack of discrimination stems from the absence of precise objectives. Too often the surgeon sets *reduction in size* as his sole aim without regard for *good contour, aesthetic details and preservation of function.* Accepta ble mammaplasty must produce the best possible functional and cosmetic end result. It must take into consideration the possibility of *metaplastic changes* in the breast tissues, of stasis or of any other pathological elements creating special problems.

STANDARDS OF CRITICISM

Every mammaplastic procedure embraces three main steps: (1) the shaping of skin flaps, (2) the formation of glandular pedicles, and (3) mastopexy. Equally important, it must include planning for symmetry and sculptural appreciation of normal form.

Safety

In shaping the skin flaps and creating the glandular pedicles, success depends in large measure on preservation of the blood supply. Without this elementary safeguard necrosis of skin and gland is an ever present hazard.

I have previously pointed out[1] the inaccuracies which have crept into so called classical descriptions of the blood supply of the breast. Without enlarging on the subject here, suffice it to summarize those elements which are essential to the evaluation of mammaplastic technics.

1. A balance is usually maintained between the two main internal and external vascular pedicles. In approximately 55 percent of cases the thoracic lateral artery plays an equal part with the internal mammary in the vascularization of gland and nipple; in 13 percent it has a pre dominant role. This counterindicates excision of the external or internal half of the breast.

2. The disposition of the two main internal and external vascular pedicles precludes excision of upper lateral and inner glandular wedges. To an even greater extent it taboos resection of the upper half of the gland (Table I).

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[1] To facilitate total removal of the epithelium it is advisable to cover same with a color ing fluid such as brilliant green.

3. The ramifications of the principal vascular pedicles of the breast participate in the formation of superficial arterial and venous plexuses

TABLE I

Main vascular pedieles of breast

MAIN ARTERIES	EXTENT OF PARTICIPATION	REGION SUPPLIED	DEPTH	PERIAREOLAR CIRCULATION
Internal mammary artery	Largest in size and length; constant participation	Main blood supply of gland in most cases	0.5 to 1 cm. subcutaneously, depending on amount of fat	Predominant in vascularization of areola and nipple in most cases
Thoracic lateral artery	Second in size; varied participation, depending on development of internal mammary a.	External half of breast; maintains balance with internal mammary	1 to 2.5 cm., depending on amount of fat on external aspect	In 13% of cases, main supply to areola and nipple
Intercostal arteries	Anastomic plexus mostly in lower quadrants. Often a main perforating branch directly into nipple	Lower quadrants; sometimes areola and nipple	Retromammary space	Mainly through a direct perforating branch

TABLE II

Periareolar vascularization

TYPE	RAMIFICATIONS	RELATIONSHIP TO SURGERY	FREQUENCY
Circular plexus	Assures maximum blood supply to nipple by extensive circular anastomosis	Safest	70 to 74 percent of cases
Radial plexus	Lack of anastomosis between thoracic lateral a. and internal mammary a., the main sources of blood supply	Deep periareolar incision will result in necrosis of corresponding part	6 percent of cases

around the nipple. These must be preserved to avoid papillary necrosis. Thus the circular areolar incision and dissection, common to all methods of transposition, should be *intradermal* (Table II).

4 The chief ramifications of the vascular pedicles are found in the anterior aspect of the breast at levels ranging from 0 5 to 2 5 cm , depending on the amount of subcutaneous fat They should be included in the skin covering

It is possible to preserve the *function* of the breast in mammaplasty if glandular resection is carried out distally from the center, without approaching the nipple closely Peripheral crescent shaped excision from the lower quadrants and resection from the external aspect also avoid injury to the galactophore ducts (Fig 7)

Form

Shaping· The form of the breast should be determined by that of the reconstructed gland However, proper shaping of the skin covering is also essential to good contour On this score, the advantages of the double skin flap over the single horizontal one are easily demonstrable *the latter always imparts an appearance of flatness* Even distribution of skin over the re shaped gland is achieved by excision of any excess along the midline and submammary fold (Fig 8)

Fixation: Firm affixation of the breast to the pectoral muscle is indispensable to a good end result Strong, non-absorbable material should be used to counteract the inherent tendency of the breast to descend *Dermal loops*, to be described later, ensure secure mastopexy (Figs 5 and 7)

Prophylaxis The hypertrophic breast may conceal or foreshadow a variety of lesions, such as fibroadenoma, intraductal papilloma and cystic mastitis The character of the hypertrophy should always be evaluated from the viewpoint of possible pathological elements as well as size

According to many pathologists[2], there is a significant predisposition to malignant change in the cystic mastitis characterized by multiple small shot-like nodules Particularly in such cases, the reduction of mammary hypertrophy, with removal of all pathological tissue, may reasonably be considered a prophylactic as well as cosmetic measure However, the value of endocrine therapy in most cases of chronic cystic mastitis should not be ignored

EVALUATION OF PRINCIPAL PROCEDURES

The choice of a mammaplastic procedure depends on the morphological and histological character of the breast No one surgical method is suited to all *cases* Thus the flabby, pendulous breast can often be successfully repaired by secure fixation and resection of excess skin In the fatty and epithelial hypertrophies, on the other hand, extensive glandular excision may be required Still other types, notably those presenting widespread cystic mastitis (adenosis) with the threat of malignant degeneration may best be corrected by subtotal amputation with or without free skin grafting of the nipple This procedure may also be indicated in massive hypertrophies in older women in whom the preservation of function is no longer a consideration

On the basis of the standards enumerated in the preceding section, all procedures based on *skin excision alone* must be rejected In this category fall the

methods proposed by Noel (3) and Pousson (4); also Dartigues' (5) and Joseph's (6) technics for elevation of the breast by means of axillary skin resection. Today three basic methods challenge comparison: glandular resection without transposition of nipple; transposition with or without resection of the gland; and amputation of the gland (total or subtotal) with free grafting of the nipple.

Glandular resection without transposition

This type of procedure consists of retromammary resection from the gland through an incision in the submammary fold. Its route allows for wide exposure of the posterior aspect of the breast and permits extensive glandular excision without interference with the blood supply since the retromammary vascular pedicle is unessential.

In view of prevalent misconceptions as to the origin of this technic, a brief historical reference is not amiss. Although the submammary approach was first suggested in 1882 by Thomas (7), with the exception of Warren (8) most commentators credit it to Guinard (9) and Morestin (10).

Warren first described a retromammary plastic resection of the gland by means of radiating V-shaped excisions extending to the subcutaneous layer. The resulting defects were sutured and the remaining gland attached to the pectoral fascia.

This basic procedure, originally employed for the removal of benign tumors, can be used in the reduction of certain types of associated hypertrophies. Guinard's cone-shaped resection and Morestin's discoid excision—both from the posterior aspect—are particularly useful when protrusion is the primary reason for correction.

The advantage of these methods lies in their preservation of the main blood supply and concealment of the incision in the submammary fold. On the negative side are the flatness imparted to the breast and a tendency to recurrence of ptosis.

I have adapted the retromammary approach to the repair of certain massive hypertrophies in older women where mammectomy with free grafting of the nipple is either unwarranted or unacceptable to the patient (11). Following glandular resection and mastopexy by means of dermal loops, the redundant skin is excised along the submammary fold, midline and lower border of the areola.

Methods of transposition

In this type of procedure the nipple and areola are separated from the surrounding skin, transposed to a higher position, and inserted into a buttonhole. The central segment of the gland remains attached to the nipple and is transposed with it.

The authorship of this method has been the subject of widespread contradiction. It was described in close succession by Aubert (12), Dufourmentel (13), and Passot (14), of whom the last two were pupils of Morestin. During the discussion of Dufourmentel's presentation in 1925, Villandre (15) announced that he had performed a similar operation in 1911 but that he believed the technic

had originated elsewhere In 1926 Mornard (16) described a like procedure, which he affirmed he had acquired from Morestin in 1909 Considering that Morestin had reported the use of an axillary buttonhole for the removal of benign tumors of the breast in 1903 (17), it appears probable that he was the originator of the method, although he never published it

Transposition with glandular resection The original technic of transposition created a single horizontal skin flap on the anterior aspect of the breast In this a buttonhole was made at the desired location of the nipple A circular incision separated nipple and areola from the surrounding skin, and they were transposed, with gland attached, to their new location

The glandular excisions varied: Aubert and Mornard resected a wedge from the lower quadrants, Dufourmentel excised from the surface of the breast, and Passot from the lower border and posterior aspect Lotsch (18) and Axhausen (19) performed virtually the same procedure

The double flap was probably first employed in the Lexer-Kraske (20) method of open transposition of the nipple combined with midline excision from the lower quadrants of the gland This improved the shape of the breast but failed to transpose it to a proper height as there was no undermining of the skin above the new site of the nipple

None of the early methods took cognizance of the need to preserve the periareolar arterial and venous plexuses during the separation of the areola nipple zone from the surrounding skin Where extensive glandular resections were made by the one stage procedure of transposition, I personally observed many instances of nipple and skin necrosis in patients operated upon by others and by myself However, the bulk of complications from mammaplasty started with the use of procedures in which the upper or either lateral hemisphere of the gland was excised Underestimating the participation of the external mammary artery in the blood supply of gland and nipple, Biesenberger (21) relied excessively on the vascularity provided by the internal mammary and inner intercostals Schwartzmann (22) and Claoué (23) sacrificed still larger segments of the gland on the strength of a similar misconception, but they preserved a periareolar dermic disc and the underlying vascular plexuses In all three procedures the remaining glandular pedicle is supplied principally by branches of the internal mammary artery penetrating the gland from the inside It has been proved that these do not always provide an adequate blood supply

The complications following lateral resection of the breast emphasize the importance of preserving *venous* drainage This is no less essential for survival of the part than the arterial blood supply *In many cases cyanosis is the earliest sign of trouble* Another cause of interference with vascularity in this method is the *torsion* incidental to approximation of the upper and lower ends of the remaining gland

In 1945 (24) I reported four instances of unilateral partial and total necrosis of the nipple in 23 cases operated upon by the Biesenberger procedure Andreassen (25) encountered cyanosis or marginal necrosis of the nipple in almost all of sixteen cases repaired by paring off the surface of the gland

As a result of adverse personal experience with the one-stage procedure and
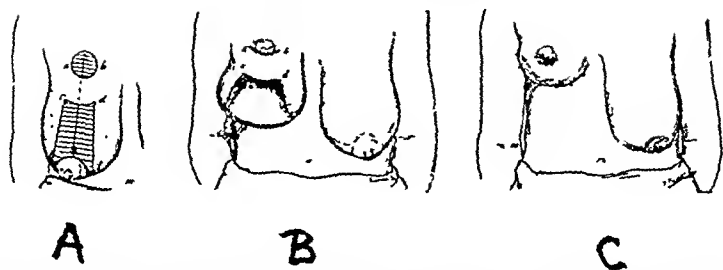
FIG. 1: Joseph's (28) two-stage procedure. A and B show transfer of diminished areola to higher position: it is transposed on a pedicle under a narrow cutaneous bridge (a-b-c-d). C.—At second stage, lower half of areola is detached from pedicle and sutured to upper border of cutaneous bridge (a-b of B). After excision of hypertrophic portions of breast, lower border of bridge (c-d of B) is sutured in submammary fold.
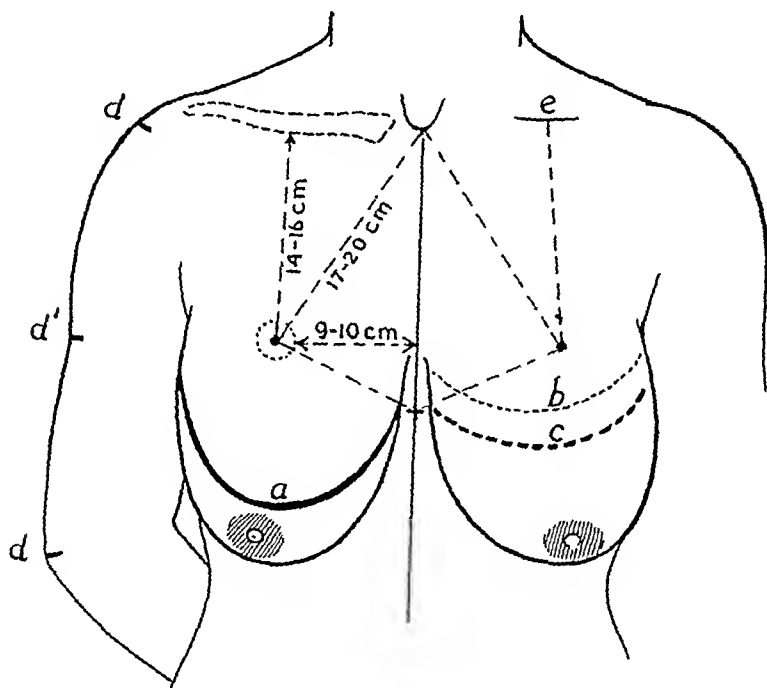
FIG. 2.: Preoperative markings to determine *approximate* nipple site and outlining of incisions.

Future center of nipple (in dotted circle) is tentatively set at intersection of vertical line (e) drawn from midpoint of clavicle and horizontal line (d') drawn across chest from point midway between acromion (upper d) and olecranon (lower d). Figures shown provide further check: nipple should be 14 to 16 cm. from lower border of clavicle, 17 to 20 cm. from sternal notch, and 9 to 10 cm. from midline, subject to patient's general build and configuration of chest.

a, incision outlining anterior flap. b, incision on posterior aspect of breast (above submammary fold, b) to which anterior flap will be sutured.

observation of its uncertain end results at the hands of others, *in 1929* I started to use a *two-stage technic for hypertrophies requiring extensive glandular excisions* (26). This not only safeguards the blood supply but permits adequate attention

to fine morphological details While I have since modified the skin flaps and method of affixation, the basic concept of the two stage conservative procedure has proved its value Using an essentially similar technic Ragnell (27) reported only one instance of necrosis of the nipple in 142 cases

My two-stage procedure differs basically from those described by Joseph (28) and Schreiber (29), which are at present seldom done Their methods were based on the assumption that the essential blood supply was preserved by the formation
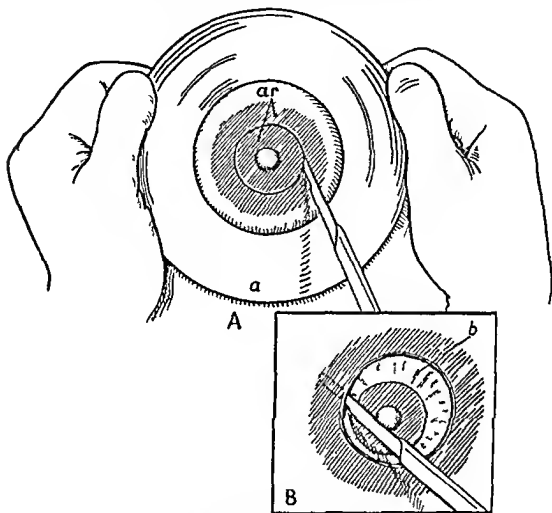
FIG 3 CIRCULAR PERIAREOLAR INCISION

of a skin pedicle to which the nipple remained attached (Fig 1) They seemed to ignore the existence of the subcutaneous periareolar plexuses which, when left intact, vascularize the nipple sufficiently without need of a skin pedicle

In our procedure, at the first stage the nipple and areola are detached from the surrounding skin by a superficial circular periareolar incision, the dissection is carried out intradermally to preserve the important arterial and venous plexuses (Figs 2, 3) An anterior skin flap is then outlined by means of a horizontal supra-areolar incision extending between the ends of the submammary fold Sufficient subcutaneous tissue is retained on the flap to ensure healthy vascularization

Its dissection is extended bluntly toward the second intercostal space to permit
upward displacement of the gland (Fig. 4). During this stage limited wedge-
shaped excision is carried out from the central segment of the upper half of the
gland (Fig. 5).

Secure affixation of the gland to the pectoral muscle is achieved by the use of
dermal loops. These are prepared from the excess skin removed from the posterior
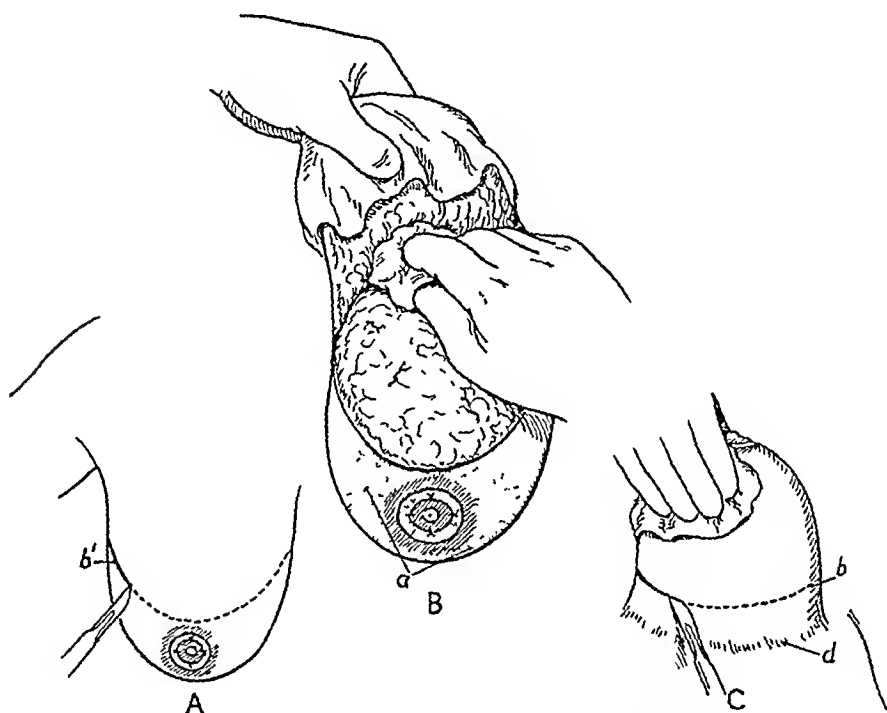
FIG. 4. OUTLINING AND DISSECTION OF ANTERIOR FLAP

A.—Outlining of flap by incision b¹. Note affixation of reduced areola to underlying
structures by sutures at each pole.

B.—Blunt separation of anterior flap in plane of cleavage favoring bloodless dissection;
note thickness of flap. Separation is extended to second intercostal space for easy upward
transposition of gland. a, area of superficial undermining of periareolar skin.

C.—Posterior aspect of breast, showing incision (b) along which anterior flap is sutured
after excision of excess skin. This is placed sufficiently high to allow easy closure of flap.
d, submammary fold.

aspect of the breast. A strip of skin is put under traction and the epithelium
shaved off with a skingraft knife.[1] Three to four such loops, about 8 to 10 inches
in length and $\frac{1}{4}$ of an inch in width, transfixing gland and pectoral muscle verti-
cally and horizontally, produce good fixation without danger of subsequent ptosis.

In making the preoperative markings for the location of the nipple, it must be
remembered that the final form, size and position of the gland determine the
site. Thus the extent of *ultimate* glandular excision should be kept in mind when

fenestration is carried out (Fig. 6). This will prevent improper location of the nipple.

After the 'take' of the transposed gland is assured (four to six weeks), the necessary glandular resections are carried out in the lower quadrants and along the external aspect. At this stage any amount can be removed without interfering with the blood supply (Fig. 7). In young women the resections from the gland are carried out radially, with the apex of the wedge *about an inch from the areola*. This
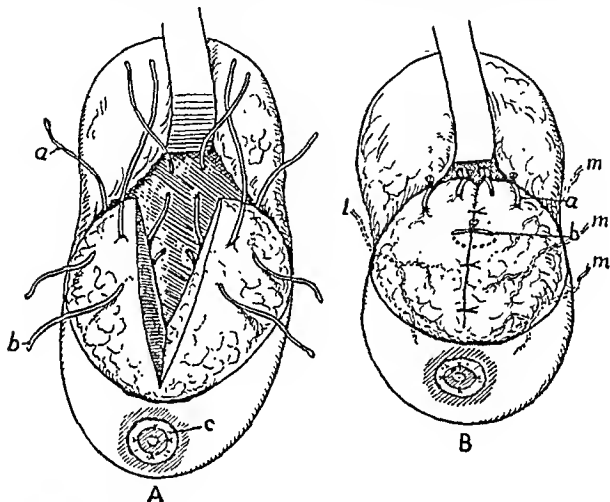
FIG 5. Wedge-shaped excision from upper quadrants. Dermal loops (a and b) tied, affixing and advancing gland. m and l, main branches of internal mammary and thoracic lateral, preserved

serves to conserve enough of the galactophorous system for near-normal physiological function.

The skin covering is shaped in a double flap along an inverted T-shaped incision (Fig. 8). Additional details are given elsewhere (24).

Transposition with moderate or no glandular resection

In prolapsed breasts with a *normal or atrophic gland*, where no glandular excision is required, the procedure can be carried out in *one stage*. This is also feasible in hypertrophies requiring only limited resection.

To ensure proper location of the nipple, fenestration should always follow shaping and affixation of the gland. The latter must usually be tightened up to give the breast the desired cone shape. This is accomplished by means of a few radial incisions extending from the areola to the periphery of the gland in the external and lower quadrants; the resulting triangular flaps are sutured in an
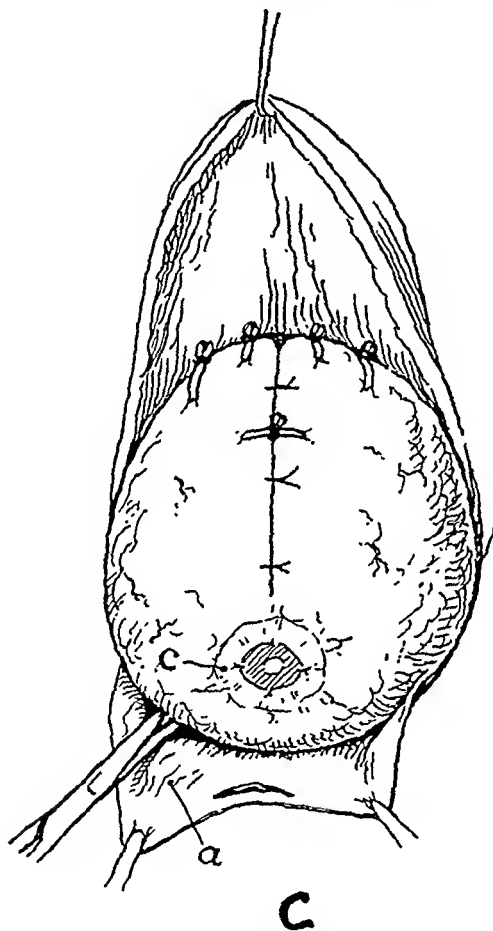
Fig 5.

C.—Showing dermal loops tied and glandular defect closed with interrupted sutures. Separation of superficially undermined periareolar skin (a) from posterior aspect of breast. e, disk of periareolar derm.

overlapping position and the gland is affixed to the muscle along its periphery with dermal loops.

Fig. 6. Final outlining of nipple site, fenestration and closure.

A.—Anterior flap (f) is drawn over *partially* reduced and affixed gland to permit *aesthetic* evaluation of future nipple site. Right hand of surgeon attempts suppression of portion of gland to be resected at second stage in order to aid visualization. Final outlining of nipple site at n. Upper d, acromion. Lower d, olecranon. d¹, midpoint between two.

B.—Excision of outlined area (n), with nipple emerging.

C.—Areola sutured in new location. Anterior flap loosely sutured above submammary fold (b). Dash-lines show disposition of dermal loops above nipple.
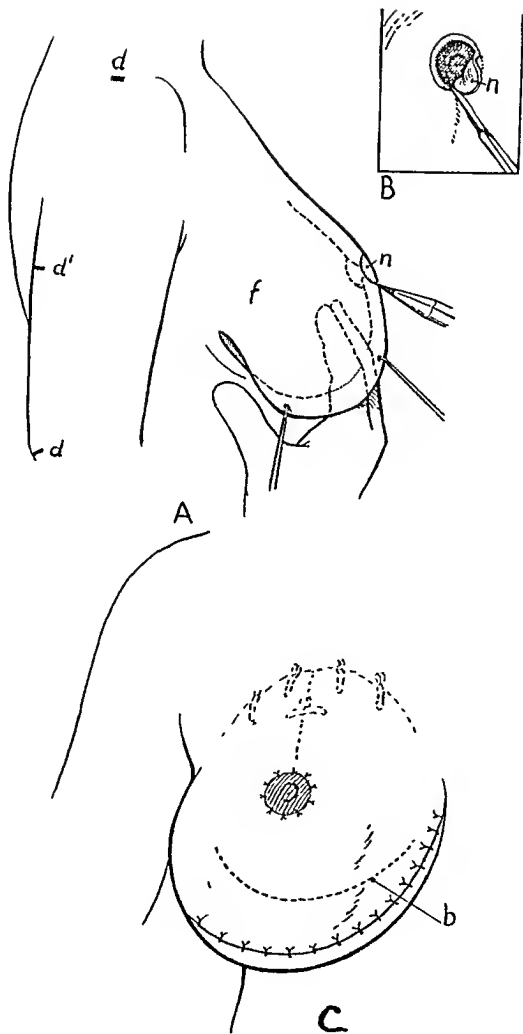
Fig. 6
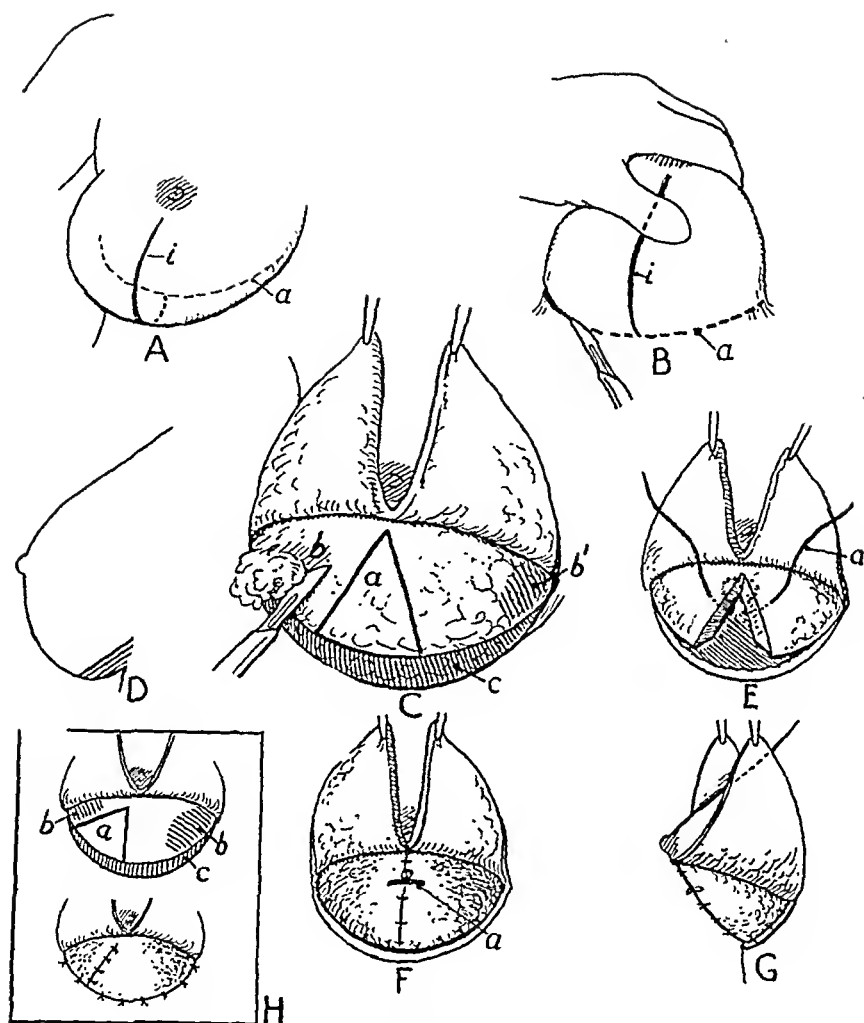
FIG. 7. SECOND STAGE

A and B.—Double skin flap formed by means of vertical incision (i) in midline and hozizontal incision (a) in submammary fold.

C.—Lower quadrants reduced by crescent-shaped excision (c) from periphery and wedge-shaped resection (a) in midline. b and b¹ indicate paring off of adipose tissue from external and inner aspects, just above submammary fold, to impart cone shape.

D.—Posterior extent of crescent-shaped excision, viewed sagitally.

E.—Insertion of dermal loop (a) for closure of midline defect. Loop enters pectoral muscle above gland, with resultant upward and forward pull.

F.—Glandular defects along midline and periphery closed with interrupted sutures. Note tied dermal loop (a).

G.—Observe convexity of lower aspect, producing cone shape.

H.—Upper sketch shows lateral triangular resection (a) required when this portion of breast is highly overdeveloped. b and b¹, paring off of adipose tissue, as in C. c, crescent-shaped excision along lower margin. Lower sketch, shape after suturing of defects.

Mammectomy with free grafting of nipple

Subtotal mammectomy wtih free grafting of the nipples has been advocated in breast hypertrophies for many years. Lexer (30) performed a double mam-

mectomy for massive hypertrophy with free grafts from the areola in 1912 Thorek (31) incorporated the covering of the areola and nipple in a free graft in 1922 Dartigues (32) also claimed priority for this technic in a paper published in 1928

This method has its indications in true hyperplasias where the breast attains extreme proportions in massive hypertrophies in women past the reproductive period or in the presence of diffused nodular cystic mastitis which may fore
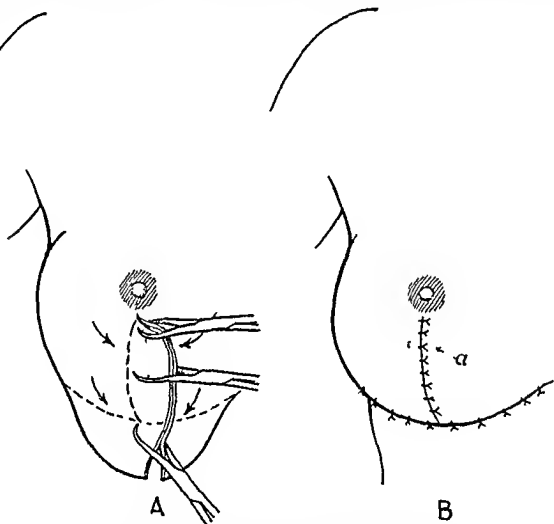
FIG 8 SHAPING AND CLOSURE OF SKIN FLAPS

A — Flaps are molded over reconstructed gland and redundant skin drawn toward mid line in direction of arrows Dash lines indicate skin areas to be resected in midline and along submammary fold Vertical line of closure shown by light dotted line

B — Suturing Wound edges are almost always approximated subcutaneously to minimize external scars a indicates dermal loop through gland

shadow malignant degeneration In no other circumstances should this drastic procedure be carried out, for it deprives the breast of its most important physiological attributes This viewpoint frequently expressed by me in the past (33, 37) is shared by most surgeons familiar with the subject

Assertions that *normal* tactile and sexual sensibility are restored to the freely grafted nipple (34) are not corroborated by the general experience, including my own In view of the fact that the part is entirely detached from its deep nerve supply, it is difficult to see how such a complete restoration could be effected
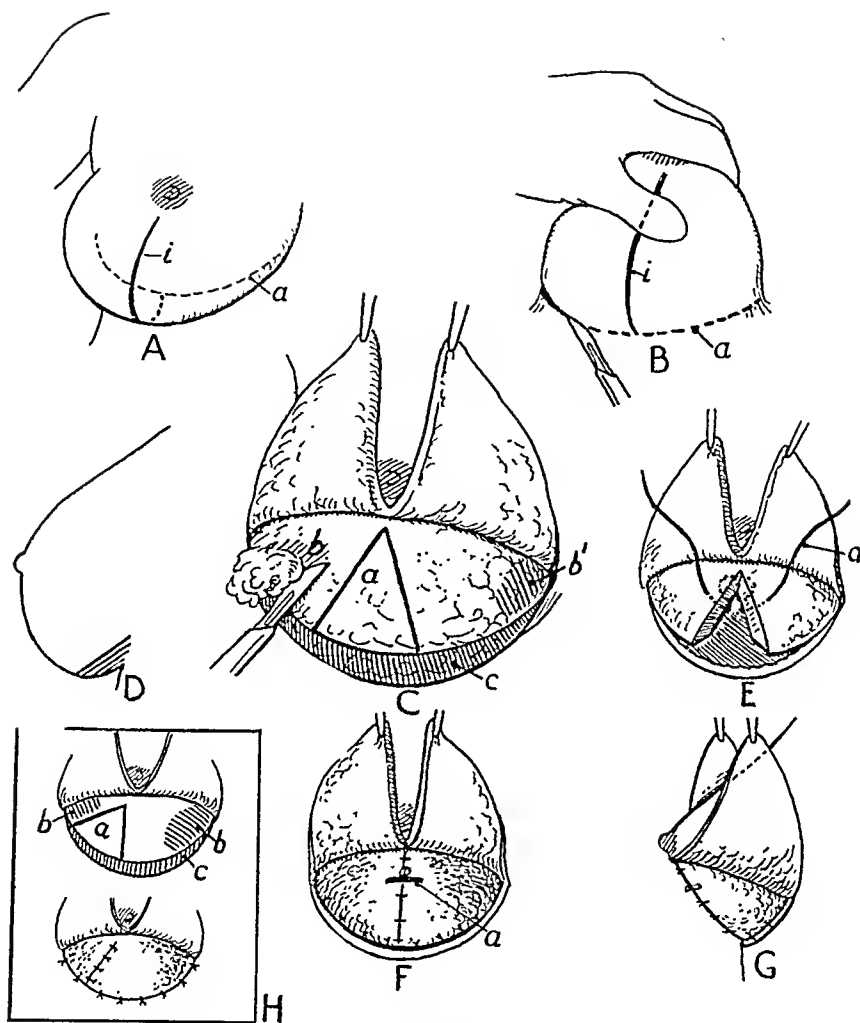
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A and B.—Double skin flap formed by means of vertical incision (i) in midline and hori-zontal incision (a) in submammary fold.

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Mammectomy with free grafting of nipple

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tion The normal tactile and erotic sensibility of the freely grafted nipple is lost or greatly reduced following this procedure

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NOTES ON A CASE OF LIP CARCINOMA

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Mrs. D. J. G., aged 34, was seen by me on 6th March 1948, with an obvious epithelioma of the lower lip. An ulcer was evident, overlying a mass $\frac{1}{2}''$ in diameter. There were no glands to be felt.

This patient had a wart on her lip 18 months previously, which had been treated with radium by a qualified radiologist. She stated that although the

FIG. 1 Before surgery, showing extent of planned excision

mass had never disappeared following radium treatment, she felt she had not given it a sporting chance owing to the fact that she was an inveterate smoker (40 cigarettes per day), and that she found it impossible to give up the habit.

Treatment consisted of the following:

1. The patient was hypnotised and told she would not, in future, enjoy smoking.

2. The right half of the lower lip was removed in its entire thickness down to the buccal sulcus (Fig. 1), and at the same time an Estlander flap was swung

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into position. This flap consisted of the right quarter of the upper lip, which was brought into the lower lip, thus giving her three-quarters of a lip above and three-quarters of a lip below.

3. Microscopic examination of the section indicated a well-developed epidermoid carcinoma, with surrounding tissues free of involvement

Fig 2 After excision and reconstruction by Estlander flap and commissure plastic

4. Three weeks later a second stage operation consisted of enlarging the mouth on the affected side.

RESULT

The lip is normal both in appearance and in function (Fig 2), there is no evidence of recurrence, and she has not touched a cigarette since the day she was put under hypnosis.

COMMENT

Too many patients with simple tumours of the lip are treated by means of radium instead of having them excised Surgery should be offered at the earliest possible moment. The use of hypnosis as an aid to surgery is here indicated.

CLINICAL ASPECTS OF EMBRYOLOGICAL SKIN DEVELOPMENT

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INTRODUCTION

Embryology of the skin is a field that has developed largely through the efforts of research scientists, yet its importance to the practising physician and surgeon must not be underestimated. Just as the eye is the keyhole to the brain, the skin offers insight into the body, and an understanding of skin embryology can be a great aid in reconstructing pre-natal history and treating congenital defects. The surgeon must likewise appreciate the anatomy, physiology, and developmental potentialities of cutaneous tissue to predict its behavior and achieve best results.

This paper is an attempt to point out the clinical aspects of embryological skin development. For that reason some developmental phases are treated briefly, while others are considered in more detail.

EPIDERMIS

Ectoderm has no power in itself to differentiate into epidermis and neural tube (Roberts). Differentiation is brought about by an inductor that is present in all parts of the embryo, but is not capable of inducing so long as it remains within the ectoderm. It operates on the ectoderm from the adjoining mesoderm and has been found to have a chemical structure allied to the ether-soluble sterols. Its existence is particularly significant in view of the conclusion stated by Roberts that carcinogenic hydrocarbons, carcinogenic sex hormones, and all other known carcinogenic agents, e.g. cold, heat, x-rays and radium, act indirectly by operating on the intra-cellular atomic organizer, in a way entirely unknown.

While the mechanism of differentiation has not been conclusively determined, the general steps in the process have been learned by direct observation. The epidermis originally exists as a single layer of cuboidal epithelium (Diasio). Division of the epidermis into two layers may be first observed in the region of the head (Johnson) and by the end of the first month of intra-uterine development the separation is complete. The epitrichial layer[1] is more superficial and owing to its normal regression and disappearance before birth it will be considered separately here.

In embryos of two to three months the epitrichial layer is histologically distinct, consisting of large polygonal cells. In three-to-four-month embryos, this layer becomes more developed and many cells assume a large, puffed-out shape. Normally this membrane is sloughed during the sixth month. However, if it

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[1] The epitrichium is a grossly separate membrane composed of the outer layer of epidermis and present in many mammals at birth. An outer layer of cells histologically distinct but not forming a grossly separable membrane is called the epitrichial layer (Bowen).

persists until birth or later, a condition known as ichthyosis congenita[2] results (Bowen). Here the fetus is born with a membranous covering having the appearance of collodion or oiled paper After a short time this covering begins to peel in large sheets leaving the normal skin beneath it in a moderately desquamating condition This desquamation is analogous to the typical shedding of the corneum in the latter months of pregnancy and gradually subsides with no permanent ill effects

The layer of cuboidal epithelium persisting between the epitrichial layer and the underlying mesoderm becomes thicker during the second month because a rearrangement of cell nuclei occurs This process continues into the third month and leads to the formation of two distinct layers The more superficial is the stratum intermedium while the deeper is the stratum germinativum (Patten) The latter is responsible for the principal growth of the epidermis

Up to this point the skin shows no evidence of true keratinization, but has changed macroscopically from its original transparent condition through the retention of nucleated cells as a stratum corneum Granules of keratohyalin may bo seen on the face during the fourth month but are still lacking in general at the fifth This keratin is mainly responsible for toughness characteristic of the superficial skin layers Occasionally overkeratinization may occur resulting in a generalized ichthyosis The skin tends to crack and form scales, though this condition may be present in all degrees of severity The appearance of keratin on the face first, and later on other body regions, is in keeping with the general pattern of differential cephalocaudal growth so apparent in embryology of the skin

From the fifth month on, increased vasculation of the cutis makes possible a rapid development of the epidermis A stratum lucidum is present on the soles and palms during the latter part of pregnancy, and at birth the epidermis is much more mature than the cutis

Congenital defect of the skin is a comparatively rare occurrence with not more than one hundred twenty-five cases reported, according to Rogatz and Davidson They cite a case with skin normal except over the hands, wrists, feet, ankles and asymetrically on the head, where a thin, transparent membrane replaced the skin This gave the gross appearance of rubber gloves, and histologically consisted of a single row of cells This defect was explained by the theory of developmental arrest, but other anomalies are attributed to inflammatory adhesions between the skin and amnion that leave a bare area when ripped off Streeter studied a large number of amniotic adhesions and gave a new interpretation to their etiology He concluded that a foetal degenerative process in the involved area is the primary cause The amniotic adhesion that develops is an expression of the general tendency of fibrous adhesions to form at any site left devoid of its natural epithelial covering

[2] Orm
milder
small ar
formation of vital internal organs

A different skin condition is reported by Bechet. In this case the patient had congenital shedding of the cornium from May to October. The rest of the skin appeared histologically normal and no etiology was proposed. This case is one of the many recorded in medical literature that cannot be explained by any general theory. These cases are evidence against adoption of any over-all explanation, and emphasize our little knowledge of the real factors involved. Until more satisfactory information is acquired it is safer to use such a noncommittal expression as developmental defect than unjustly to accuse developmental arrest.

A study by Cowdry and Thompson should be mentioned before passing on to other aspects of the epidermis. These workers sectioned the footpads of growing mice and divided the epidermis, excluding the basal layer, into three parts. They counted the mitotic cells and found a significant number in each division with the most numerous in the middle third. By demonstrating that cells in the middle third are capable of completing mitosis, this study suggests the anatomical basis for epithelial grafts. These are thin grafts cut to include only the outermost portion of the epidermis. Consequently, they are very mobile and the absence of hair makes them particularly adaptable to plastic replacement of mucous membrane and repair of mobile surfaces such as the eyelid (C. R. Straatsma).

Folds in epidermis

Pinkus considers all folds of the skin to be either visceral folds or folds of movement. The latter consist of fine triangular, rhomboidal, and trapezoidal arrangements over the entire surface, as well as larger folds of movement. The pattern of large palmar folds is established by the sixth month of intra-uterine life, and consequently cannot be affected by diseases of late uterine life. A normal palmar pattern in conjunction with a congenital disease suggests a defect in the parental germ cells through which a disturbance of development occurred. True hereditary diseases, e.g. the majority of congenital dislocations, are accompanied by a normal pattern of palm folds. On the other hand, an abnormal palm indicates a disturbance that occurred in utero. Mongolism is characteristically accompanied by one sharp line across fingers two, three, four and five. Clinically, the absence of this condition in a child otherwise mongoloid should raise suspicion of another disease, such as congenital syphilis (Nassau).

The dermatoglyphics or visceral folds of Pinkus develop embryologically in conjunction with walking pads, found consistently in mammals and prominent in dogs and monkeys. Such pads appear in human embryos in the latter part of the second month and stand out prominently as in the adult monkey at the three-month stage. They regress at a variable rate; during the fourth month isolated patches of ridges appear and gradually merge to form the adult pattern (Cummins). The dermatoglyphic areas on the hand and foot owe their general ridge configuration to hereditary factors,[3] though the disposition of these ridges in the

[3] Though the general configuration (whirl, loop or arch) is usually determined by heredity, deviations may occur within families. The difference in prints of mono-chorionic twins may be so great that Cummins concludes that chorionic history cannot be determined on the basis of dermatoglyphs alone.

developing fetus is governed indirectly by growth This is illustrated by the prints of "identical" twins which differ more on the feet than on the hands Here the foot differentiates later than the hand, and non hereditary forces have a longer interval to exert their influence An abnormal print consisting of dots and short irregular lines indicates excessive pressure and tension in the developing fetus, possibly a water-logged state of the tissues This condition probably has widespread involvements, its frequent incidence in epileptics, insane, criminals, and imbeciles indicates that the central nervous system may be included (Cummins) [4] Dermatoglyphics may be destroyed in leprosy and they undergo shrinkage following destruction of nerves to the hand

CUTIS

"The corium is at first an amorphous, relatively undifferentiated structure in which are many round, clear nuclei of the mesenchymal type" (Quoted from Lynch) The origin of these nuclei is disputed, many believing that the outer most arise from the ectoblast As evidence, they point to the fact that the papillary corium—even in adult tissue—reacts to forces and pathological changes with the epidermis rather than with the reticular corium Cellular differentiation is rapid During the first and second month both fixed and wandering cells can be seen which are connected by cytoplasmic processes and contain delicate fibrils in their cytoplasm (Patten)

The connective tissue is gradually transformed from cell rich fiber poor to cellpoor fiber rich by the accumulation of reticular, collagenous, and elastic fibers The origin of these fibers is one of the great unsettled questions in embryology However, one experiment by Lewis is worth citing in this regard The work was done on tissue cultures of chick embryos just after the first true fibers appeared in the connective tissue Existing fibers, cut in removing the sample, failed to increase in length or size while in the culture After twenty-four hours in the culture, however, delicate fibrils appeared as growths of cellular evoplasm The fibrils gathered into bundles and later developed into definite fiber These fibers never became so adult that the individual fibrils could not be traced to some cell near or far It is not known just what happens to the fibrils when parent cells undergo mitosis Possibly during this phenomenon they are separated from their parents and remain as free fibrils

Returning to human embryos, the reticular fibers seem to be the least differentiated of the three types and are regarded by some as precollagen Collagenous fibers increase during the third month, they are responsible in the following month for division of the corium into papillary and reticular portions Fibers in the former run haphazardly, while in the reticular portion they run in nearly parallel bundles (Lynch)

There are in general two networks of elastic fibers corresponding to the two

systems of collagen[5]. However, elastic fibers arise later both phylogenetically and ontogenetically and are first seen in the skin during the fifth month. The concept of the function of these fibers is undergoing a change. Lynch states that the elastin system acts as a framework for the attachment of muscle fibers to the skin. More generally, Sternberg says that extensibility is determined by the arrangement of connective tissue fibers, and that over-distention is prevented by the elastic system. In post-mortem studies of the aorta, he showed that elasticity in the ordinary sense is greatest when the amount of elastic tissue is least. (Lynch after Sternberg).

The question of skin elasticity has considerable clinical importance. Evans, Cowdry, and Nielson studied comparable samples of skin from young (19 to 30 years of age) and from old (80 to 94 years of age) subjects. They found that the epidermis was fairly constant at all ages, but that during staining the cutis in younger samples contracted 38 to 58 per cent and in the older about 12 per cent. This variable skin reaction has a direct application to the questions of surgical tension so important in obtaining fine scars in plastic surgery.

A fairly common congenital skin condition known as cutis hyperelastica or the Ehlers-Danlos syndrome results from a pathological hypertrophy of the elastic fibers in conjunction with a rarefaction and torsion of the collagenous fibers. Features of the syndrome include an excess elasticity of the skin, formation of tumors or swellings in the skin, and a tendency to develop deep cutaneous splits that heal slowly, leaving characteristic broad and nodular scars. This syndrome tends to follow family lines, indicating that hereditary factors are involved (Burrows and Turnbull).

A division of the cutis into corium and subcutis can be made in the third month on the basis of the looser structure of the latter (Lynch). During the following month the first indication of lipids can be seen with fetal cells. Droplets appear and later coalesce to force the nucleus to the periphery. According to Patten, it is probable that all fat cells in the fetus and the adult arise from undifferentiated mesenchymal cells and not from transformed fibroblasts. Extensive accumulation of subcutaneous fat does not occur until the last two months of pregnancy, and the wrinkled and wizened appearance of premature infants is largely due to lack of fat normally acquired during the ninth month.

The thickness of subcutaneous tissue is often measured clinically to indicate the nutritional state of children. It normally increases rapidly from birth till about nine months of age and then diminishes until five and a half years of age. At this age it is about one-half the thickness found at nine months. The amount then remains fairly constant until about eleven years, when an increase occurs that appears to be the beginning of an adolescent accumulation. Throughout childhood more subcutaneous tissue is usually found in females than in males (Stuart and Sobel). In any particular clinical situation measurements[6] must be

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[5] Collagen and elastin are both albuminoids which develop as biochemical differentiations of impregnation of the same basic structure. This differentiation is sufficient to permit differential staining and histological separation.

[6] Measurements are taken on the back of the calf, a region less subject to variation than the abdomen.

considered in the light of typical variation for age, sex, and body build, as well as history and other clinical findings

JUNCTION OF THE EPIDERMIS AND CORIUM

In early specimens of human embryos there is a clear distinction between the epidermis and the underlying corium The tissues are not mutually adherent However, as the corium develops, more cells and fibers are formed and the two tissues are pressed together The plane of union remains smooth until the fourth month when the lower surface of the epidermis becomes markedly irregular (Patten) Coanective tissue buds project into these epidermal recesses aad are known as papillary bodies Many steps in the histological unioa of these two layers are not known and, in fact, the nature of the juncture in adult skin is not agreed upon However, one of the more complete studies on adult skin was made by Szodoray, who described three elements participatiag in this union oae, pro cesses of the basal epithelial cells passing down into the connective tissue of the papillary layer, two, fine lattice fibrils extending from the subepithelial layer to the epidermis, three, elastic fibers lying parallel to the junction and just beneath it, sending ramifications that pass vertically to terminate in the epidermis The connection thus resembles two brushes fitted together along their bristle surfaces, and results in a firm and continuous union

The histological nature of this juncture is important in cases of pathological blister, such as epidermolysis bullosa and pemphigus In this condition separation of corium and epidermis cannot be explained on the basis of pressure due to accumulation of fluid between the two layers A change of adhesive forces holding the two together must be assumed Felsher conducted experiments on the rela tionship between these adhesive forces and the swelling of collagen brought about by varying concentrations of acid, base, and salt solutions He concluded that the swelling pressure of collagen is sufficient to rupture elastic and reticular elements in the corio epidermal junctioa Swelliag of collagen in the upper corium may, therefore, lead to blister formation and coatribute to pathological condi tions

CUTANEOUS LYMPHATICS

There are two stages ia the developmeat of the general lymphatic system The first is the origin of primitive lymph sacs that develop as evaginations of the venous system and are present in six week embryos (Patten) These sacs are transformed into the primordia of the lymphatic system by connection through communicating ducts and through formatioa of valves at their juncture with the venous system The second stage consists of the development of nodes and peripheral lymphatics (Sabin) The latter stage can be studied only by injection methods which have not been used on scarce human material However, in the pig, Sabin reports that skin lymphatics start at certain centers and grow out over the surface The first is in the neck, from which capillaries extend to cover the head, shoulder, and neck The second is located at the crest of the ilium and is the center for capillaries of the back and hip Later concentrations in the axilla

and inguinal region send vessels to the ventral aspects of the body wall and the limbs.[7]

While this work is on the pig, it may indicate the general developmental pattern used by human embryos in forming the very extensive lymphatic plexus found by McMaster in the reticular layer of the corium. Flow through the channels of this plexus is far more rapid than is usually supposed because lymph capillaries are often flat and ribbon-like, with the result that the flow of a small quantity of fluid may carry a foreign substance a considerable distance. These lymphatics are extremely sensitive and react to sunlight, physical stroke, burn, or surrounding injury by greatly increased permeability without loss of actual anatomical continuity. Therefore, like blood vessels, they respond to injury by pouring fluid into the region. However, they regain their normal permeability sooner than do the blood vessels, and one may conclude that foreign substances are carried away by lymphatics and pass through regional lymph nodes before entering the blood stream. In these nodes a crude filtration occurs and antibodies are formed. This cutaneous plexus is so dense that any cut which breaks the continuity of the skin introduces substances directly into the lymphatics. It is therefore important to realize that "immunity against disease, conferred by preventive injections, even the reaction to the injection itself, is not merely a skin phenomenon but a generalized activity of the lymphatic system," to quote from McMaster.

This antigen antibody reaction occurring in response to foreign protein may be the major factor in explaining the failure of homografts. With the exception of "identical" twins, these grafts have failed in every case attempted. When skin from "identical" twins is used, the grafts take and survive. In other instances there is an initial take, with the homograft presenting a normal gross appearance for from two to eight weeks, at the end of which time it appears to melt away in conjunction with a vascular breakdown (Converse and Duchet). However, as early as the fourth or fifth day the initial inflammation can be seen histologically, consisting mainly of lymph and plasma cells. Gibson and Medawar, in an attempt to learn the nature of this reaction, applied a second set of homografts when the reaction to the first was at its height. They found that breakdown of the second set was accelerated, and concluded that the reaction to foreign epidermis results from a process of active immunization.[8]

It is probable that increased understanding of the lymphatic system will lead to explanation of many currently mysterious skin reactions. Keloids, caused by an unbridled repair process that forms a massive scar and invades normal tissue, are a particular problem in cosmetic surgery because they have a tendency to grow and recur. C. R. Straatsma suggests that keloids may be related to lymphatic phenomena, basing this proposal on the tendency of keloids to occur in areas of marked lymphatic activity. Investigation of the lymphatic system,

[7] Huntington denies the origin of lymphatic capillaries from ends of the venous system. He states that lymphatic endothelium develops independently of vascular endothelium.
[8] The complexity of cutaneous immunizing reactions may be illustrated by the work of Goldfedar. He cites investigations in which resistance to malignant growths, including leukemia, was conferred on hybrid mice by injection of skin from normal embryonic mice.

owing to its diffuseness and the difficulty of visualization, is still in its infancy, but further research in this field will be most beneficial to the medical profession

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PIGMENT MIGRATION FOLLOWING "Z" PLASTY[1]

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Previous experiments, Barker (1, 2), as well as the work of Loeb (3) and Sale (4) have shown that following the grafting of pigmented skin to a white area there is an invasion of the white area for a period of up to 120 days. In reviewing that work several problems presented themselves. 1. Will there be a migration of pigment to the surrounding white areas following simple procedures involving both the black and white skin? 2. If the natural border is not disturbed during a surgical procedure even though it is part of a flap which is shifted will the pigment migrate beyond the former natural border?

In approaching the above problems it was felt that by using "Z" flaps along the normal black and white borders both of the above problems could be worked out in one procedure. However in several of the animals a simple incision was made extending from the black areas to the white area. Fig. 1 shows the immediate result obtained in the transfer of a black flap with a white border to a white area, and a pure white flap to a black area. In making the flap one should be careful to go outside of the normal black and white border line. In this operation the normal anatomical border between the black and white skin has not been disturbed except at the tip of the flap. This gives one a chance to observe whether there will be pigment migration to a white flap in which there is a good blood supply, and also whether the pigment will go beyond the normal black and white border.

RESULTS

Thirty black and white guinea pigs weighing about 250 gms were used. The operations were done under intraperitoneal Nembutal anesthesia. After surgery the guinea pigs were returned to the individual cages without bandaging. Observations were made at weekly intervals for a period of four months. In all of the flaps observed in this study there was a quiescent period following healing of about 4–6 weeks. From this time on there was a gradual invasion of the white area by the surrounding black pigment, both across the cut edge of the black skin and also the normal anatomical boundary. Figs. 2–4 show guinea pig no. 2 from six weeks after the operation until the end of the observation at nineteen weeks. In this and one other experiment apparently some of the black pigment was transplanted to the white area by the suture material, as can be seen in these pictures. In these pictures the appearance of a black area outside the normal black area at the end of six weeks has enlarged and finally coalesces with the progressing rim of black pigment. Fig. 5 shows the large amount of invasion which sometimes takes place. Guinea pigs 11, 12, and 22, in which a simple

[1] Work done in the Department of Oral Pathology, The Thomas W. Evans Museum and Dental Institute, School of Dentistry, University of Pennsylvania.

Fig 2 Six weeks after operation, notice black area in white flap
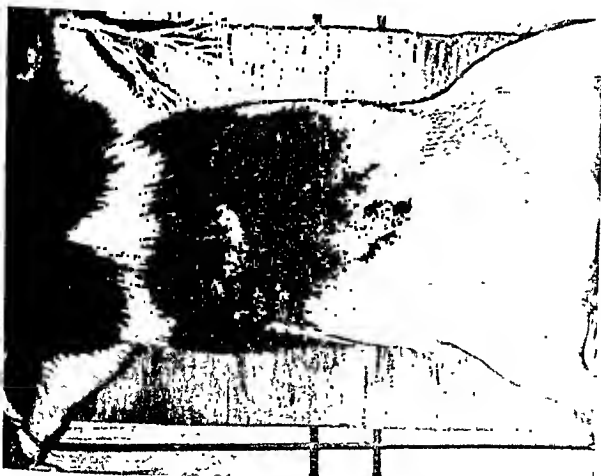
Fig 1 One week after operation

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incision was made, all showed invasion of the white skin along the line of the incision into the white area.

Fig. 5. White area nearly covered at four and one-half months

DISCUSSION

In these experiments, as in those in which pigmented skin was grafted to white areas, there was a gradual invasion of the white surrounding skin by the black pigment. This also occurred in simple incisions from black to white skin. That the pigment cells are easily transplanted is shown by the black pigment nests which developed in the suture holes in the white skin areas.

CONCLUSIONS

1. Black pigment migrates to the surrounding white skin even after a simple surgical procedure.

2. The transplantation of black pigmented cells by suturing is possible.

3. Following the rotation of a black and white flap the pigment migrates across the natural border even though it has not been disturbed at that point.

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THE VALUE OF HOMOGRAFTS

(A CASE REPORT)

FREDERICK J McCOY, M D:

Tissue transplanted from one individual to another of the same species is a homologous graft or homograft, it is also referred to as an isograft

The idea of transplanting skin from one individual to another within a species or even from one species to another (zoograft) is as old as the concept of skin grafting itself However the only authentic reports of permanent survival of transplanted homologous skin have been in cases of monozygotic twins (3) In this respect skin resembles the so called "vascular" tissues of the body On the other hand relatively ' avascular" tissues such as cartilage, cornea and frequently bone are transplanted successfully

It was commonly agreed, as recently as the early nineteen hundreds, that skin could be transferred from person to person without undue risk of ultimate failure But by 1910 enthusiasm began to wane, with more critical observation, and the pendulum swung to the opposite extreme Leaders in the field were writing '—the result will most certainly be nil, tho success of isografts may be relegated to mythology" (McWilliams), and, "Homografting promises nothing and the trouble and suffering of the donor is without avail" (Lexer)

Following this, certain groups evolved a somewhat more conservative attitude, feeling that homografts should be applied to burned patients who seemed to be 'slipping' daily from pain and debility despite apparently adequate supportive measures (2) It was felt that such patients could not be subjected to the risk of a general anesthetic and the surgical trauma necessary in obtaining and applying autografts Such homografts were considered emergency "dressings" to give the patient respite from pain and body fluid loss, and to gain time for re cuperation in preparation for ultimate autografting

With recent advances in nutritional research and a better understanding of fluid balance and whole blood replacement tho picture has again been altered somewhat Parenteral and oral protein hydrolysates and electrolytes, when given in conjunction with large quantities of whole blood, almost invariably bring about a satisfactory response in even extreme cases of debility It is the rule rather than the exception for cases referred to the plastic service to arrive in a severe state of inanition resulting from weeks or months of pain and uncompensated blood and fluid loss, leaving the patient a miserable, apprehensive wraith whose one desire is to be unmolested by dressings There have usually been one or more attempted skin grafts the total contribution of which is at best an incomplete 'take" of the grafts, and it worst the addition of more denuded and infected areas where the grafts were taken—incidentally destroying their future usefulness as donor sites Such a patient often presents the picture so aptly termed "chronic shock" by Dr Mims Gage It is characterized chiefly by a severely contracted blood volume coupled with progressive anemia Prompt and adequate replace-

2. The transplantation of black pigmented cells by suturing is possible.

3. Following the rotation of a black and white flap the pigment migrates across the natural border even though it has not been disturbed at that point.

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infested with maggots He complained of chest pain Because of dressings neither the blood pressure nor an ECG were obtainable, but a clinical diagnosis of toxic myocarditis was entertained Portable x rays showed atelectasis of the right lower lobe The patient was given plasma and whole blood before moving him from the litter on which he arrived, and shock position and oxygen were necessary for the next 24 hours

Because of the urgent condition of his dressings these were changed the following day under light anesthesia and third degree burns found to involve at least 60 per cent of the body surface, (figure 1) Two inches of the stump of the left femur were exposed All surfaces were clean enough for immediate grafting Large decubitus ulcers were present over the sacrum and two of the spinous processes Wet dressings were applied It was obvious at this time that no more than two full drums of skin could be taken from the areas available as donor sites (upper back) It was likewise obvious that an estimated 23 drums
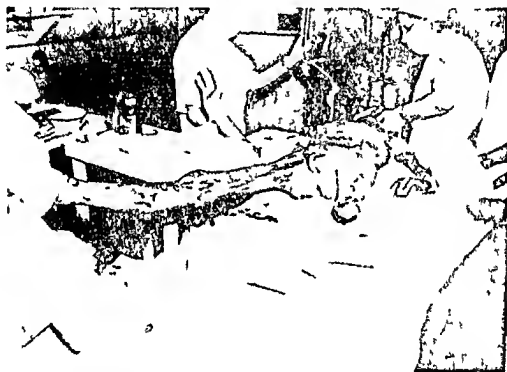
of skin would be required to provide urgently needed coverage for the granulating surfaces

Two days later he had shown but slight response to therapy His pulse remained weak and irregular Temperature hovered constantly at 101 to 102 degrees, and his mental outlook continued to deteriorate Repeated blood examinations remained essentially the same, viz HB 12 5 rbc 3 5 and total proteins 1 7

Homografting was decided upon and 16 volunteers were selected to provide the estimated 23 dermatome drums (736 square inches) of skin needed to cover all burned areas Whole   illed 5 100 and 4 700 cc respectively
  the patient and 16 donors were taken to surgery
faces except those on the right brachium and the decubiti[1] Although the entire procedure required six hours the patient s anesthesia time amounted to only 50 minutes (figure 2)

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[1] This is believed to be the most extensive transfer of skin in a single operation yet to be reported

FIG 2 A "stocking" of loosely sutured grafts is being applied to the right lower extremity (Wakeman U S Army Photo)

FIG 3 Five days postoperatively 90% of the grafts are viable Letters indicate that blood grouping did not affect the "take" (Patient is type O) (Wakeman U S Army Photo)
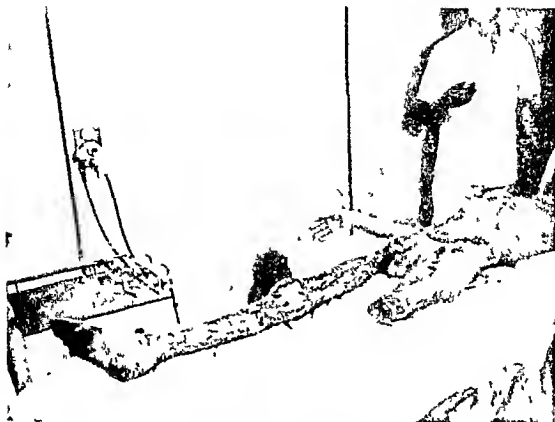
Fig 4a. After six weeks homografts are still viable about the right thigh, knee, leg and left thigh Spontaneous epithelization has occurred in many places (Note areas on left chest).

Fig 4b The decubiti over sacrum and spinous processes have improved markedly (Valley Forge U S Army Photos

The response of the patient to skin grafting was dramatic. Within 72 hours the ashen pallor of his face gave way to a tinge of color. His temperature returned to normal limits and his pulse rate dropped correspondingly and became regular and strong for the first time since coming under our observation. His appetite reappeared. With his newly acquired freedom from pain his morale improved rapidly.

On the sixth post-operative day the grafts were dressed, and the "take" estimated to be 90 per cent (figure 3). On this date the rbc was 4.5 and the Hb 13.5. Whole blood and plasma therapy were continued.

At this point the patient was again transferred to another hospital. There, thru the courteous cooperation of the medical officers concerned, it has been possible to follow his progress. Only supportive therapy was given during the following six weeks during which time the blood picture continued to improve, viz. Hb 80 per cent, hematocrit 45, and total proteins 6.0. At this time approximately one-third of the homografts were still viable or had been replaced by spontaneous epithelization. At eight weeks resolution was practically complete and autografting was begun.

It is important to note that at no time following his homografting did the patient's condition return to its previous desperate state, although less effort at prevention was required than had been previously expended to no avail.

SUMMARY AND CONCLUSIONS

It has been pointed out that homografting has enjoyed various degrees of popularity in the past, and a clarification of its place in modern burn treatment is offered.

It is emphasized that homografting is a temporary expedient whose primary function is to save life by halting excessive loss of fluids. Properly employed, it will be indicated only in those rare instances where there have developed severe complications, or where there is a lack of response to adequate electrolyte, blood and protein replacement.

Autografting, as the procedure of choice, can be utilized in practically every instance where the patient has been able to survive the initial shock of his injury.

A case is presented in which a combination of circumstances brought the patient to a moribund state. Massive homografting was felt to be necessary to preserve life.

Homografting should be considered only a life-saving expedient, and as such is rarely indicated in the intermediate stages of burn therapy.

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A NEW OSTEOTOME

DR. EMILIO ALDUNATE
Santiago, Chile

Chisel, hammer and saws (Joseph) are commonly used in rhinoplasty, and not without hazard, to reduce the nasal bridge, sever spurs and the nasal processes of the superior maxillae

The instrument now to be described is more advantageous in author's opinion in that it enables the surgeon to make a wholly controlled and clean separation
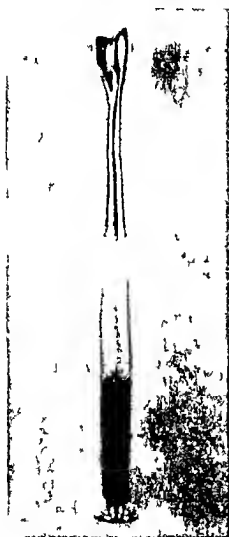
FIG. 1a. NASAL OSTEOTOME   FIG. 1b

of bony structures. Inadvertent damage to adjacent or contiguous tissues is thus avoided

The present writer has devised what he deems an easily manipulated and completely satisfactory nasal osteotome for the aforementioned purposes. It is a simple chisel attached to the nether surface of a protecting metal olive (Fig 1a). The convex inferior aspect of the olive is so contrived that it can be made to

slide and press firmly on bone in any contemplated angle or direction. (Fig. 1b). On the upper aspect of the olive extremity of the chisel is a blunt elevation which protrudes to a degree which permits the progress and direction of the instrument to be observed while passing subdermally. The instrumental elevation is continuous in a straight line with the shank of the chisel.
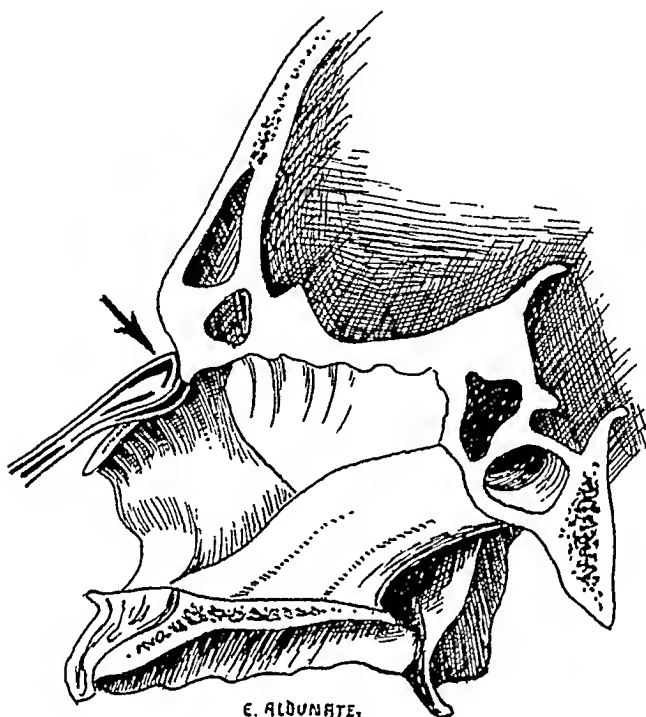
E. ALDUNATE,
FIG. 2. OSTEOTOME IN POSITION

The sharp end of the chisel forms an angle approximately 90 degrees with the inferior aspect of the olive. This arrangement makes it certain that in chiselling the nasal bridge, for example, the extremity of the instrument does not pass beyond bounds because the aforesaid angle enables the anterior rounded extremity of the olive to come in contact with the glabella at the precise moment when the operation ends. (Fig. 2).

Thorough undermining is essential for the efficient use of the osteotome.

AN IMPROVED SKIN HOOK

LEO L. LEVERIDGE, M.D.

From the Surgical Service, McCloskey Veterans Administration Hospital, Temple, Texas

Use of skin hooks is second nature to surgeons experienced in procedures requiring a minimum of tissue trauma. Nevertheless, some awkwardness can be observed. It will be noted that a conventional skin hook is held near the center
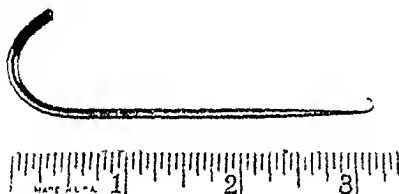
FIGURE 1 SKIN HOOK WITH SHORT CURVED HANDLE
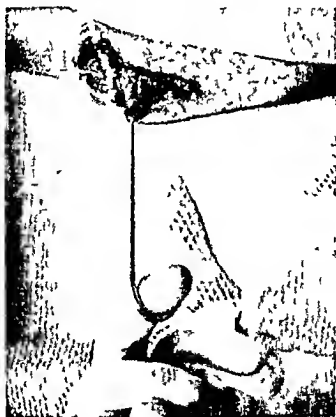
FIGURE 2 Case E. S., Scars following lacerations of chin. Defect recreated at operation. Skin hook held with one finger to retract small skin flap

of the handle. The remaining half of the handle is superfluous until, as the fingers tire, they slide toward the far end. The smooth, rounded handle gives a poor grip. Relative to the gentle retraction required, it must be held with disproportionate force.

The illustrated skin hook (Fig. 1) is employed with striking ease and precision. The short handle ($3\frac{1}{4}$ inch over-all length) permits easier manipulation of skin flaps or skin edges. The handle end was curved to fit a finger. This enables an effortless purchase on the handle with one finger alone (as illustrated in Fig. 2), or with finger and thumb grasped lightly together. The curve of the handle points in the same direction as the skin hook, in order to orient the operator without diverting his eyes. This design is inexpensive to manufacture. (The illustrated skin hook was easily made from a $\frac{1}{8}$-inch thick stainless steel Steinmann pin.)[1]

[1] Mr. Ronald Earle Grubbs, Hospital Machinist, McCloskey Veterans Administration Hospital, Temple, Texas, made the illustrated skin hook from author's design.
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SUTURE SCISSORS FOR PLASTIC SURGERY

LEO L. LEVERIDGE, M.D.

From the Surgical Service, McCloskey Veterans Administration Hospital, Temple, Texas

Single strand plastic sutures have become justifiably popular in plastic surgery about the face; yet none of the commonly used instruments is suitable for their removal.

The points of large scissors will not fit into closely spaced loops where small bites of tissue have been taken in suturing. Small scissors, such as eye or cuticle scissors, do fairly well when new, but the hard, smooth, round suture tends to
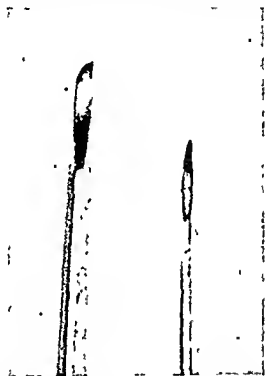
FIGURE 1a. Modified suture scissors: profile view of blade comparing its fine point with that of ordinary "stitch scissors" on left

slide away as the thin blades close upon it. These small scissors become loose and dull quickly. Scalpels are undesirable because they cut plastic sutures poorly and the sawing action tends to disrupt the wound.

To prevent "cross-hatching", sutures about the face are generally removed in 48 to 72 hours. At this time the perfection of an accurately closed wound is easily lost if it is pulled upon by removing sutures with an instrument which cuts badly.

The hospital machinist[1] was asked to copy ordinary "stitch scissors", making the point finer (Figure 1 a) and the concavity greater (Figure 1 b). They were

made by shortening discarded, broken, straight scissors. This instrument has served well. Whereas the point of ordinary "stitch scissors" can not fit into the small loops used in this type of suturing, the fine point of these modified scissors is introduced quickly and with ease (Figure 2). The blades have a clipping action which is adapted to these round brittle sutures. Even when use has made them

FIGURE 1b Modified suture scissors. full view of blades comparing greater concavity and pointedness with ordinary "stitch scissors" on left.

FIGURE 2. Case. E S. Revision of scars Wound 48 hours post-operative. Removal of suture with modified suture scissors.

no longer sharp enough to cut silk well, they remove 4-0 silkworm gut sutures readily and without disturbing the healing wound.

"Stitch scissors" with the above described small, but essential, two modifications developed expressly for removing plastic sutures were found markedly superior to instruments commonly employed for this purpose.

INTERNATIONAL ABSTRACTS
OF PLASTIC AND RECONSTRUCTIVE SURGERY

GRAFTING

Stallard, H. B.: **Ectropion Corrected by Bridge-Pedicle Graft.** *Brit. J. Plast. Surg.* 1 77, July, 1948

Stallard describes a case of ectropion of both lower lids, which was characterized by marked hypertrophic changes in the everted palpebral conjunctiva, and infiltration of the subconjunctival connective tissue with plasma cells. Both lower lids had been infected and inflamed for eight years. The skin of the lower lids had become shortened and had lost most of its mobility.

The everted and thickened conjunctiva was excised, the remaining palpebral conjunctiva undermined and the free edge sutured to the lid margin. The lower lid was then incised transversely throughout its extent, 4 mm. below the lid margin, and undermined upwards and downwards. The defect thus created was filled with a bi-pedicled flap brought down to supply adequate skin to the shortened lower lid, and to afford a slight support for holding up the lower lid margin. The defect in the upper lid was closed by sliding flaps. Paramedian tarsorrhaphy was done and left for three months.

The bridge pedicle took one hundred per cent and healed by first intention.

This method has been used on four patients by the author.

Editorial Comment. Photographs before and after operation show an excellent end result from this operation, both lower lids being restored to their normal position, and symptoms being relieved.

Penn, Jack: **Zig Zag Modification of the Tubed-Pedicle Flap.** *Brit. J. Plast. Surg.* 1 110, July, 1948

A method of tube pedicle formation is described by Penn, parallel zig zag borders

being used instead of straight borders. By
this method, the donor area closes with little
tension, thus leaving a good scar. The suture
lines on the flap and on the donor area do not
overlie one another. The scar of the flap,
zigzagged and thus elongated, allows for
greater mobility of the flap in transfer.

BURNS

Glover, Donald M.: Transition in Burn
Treatment; The War Years. *Am. J.
Surg. 76:* 547, Nov. 1948.

Glover draws upon his wide experience
over the past thirty years in reviewing the
changes which have taken place in the man-
agement of all types of burns.

The reduction in mortality that occurred
during the tannic acid coagulation phase of
local treatment is attributed to renewed in-
terest in burn physiology. Glover believes
that the present vogue of using pressure
dressings has not reduced mortality and
varies little from methods employed prior
to the use of tannic acid.

The management is set up on the basis of
the extent of the burn, the depth of the burn,
the presence of shock and of hemoconcentra-
tion. For second degree burns the use of
plasma and electrolytes is generally con-
sidered adequate, since red-cell damage is
not the usual rule. However, in case of third
degree burns it is best to omit plasma
therapy and use whole blood, since damage to
the red-cell mass has usually occurred. The
author advises that anuria be treated by ob-
servation rather than by massive fluid and
electrolyte therapy. Secondary anemias
and infection should be combatted with
whole blood and specific therapy. Local ther-
apy should not be instituted on any vigorous
plan of time. The more superficial burns are
usually healed in two weeks, while those of
full-thickness skin loss should be watched
for the development of infection. All efforts
should be made to remove slough quickly and
cover the wound with skin grafts. Dakin's
solution appears to be the most effective
local agent in preventing infection, removing
slough and preparing the surface for grafting.

Edtiorial Comment: This report consti-
tutes both an unbiased and workable review
of the literature, and a carefully compiled
set of rules in the treatment of burned in-
dividuals as to systemic management and
local therapy.

Wallace, A. B.: Treatment of Burns (A Re-
turn to Basic Principles). *Brit. J. Plast.
Surg. 1:* 232, Jan. 1949.

Wallace has used the pressure-dressing
method of burn treatment for years and as-
cribes the benefits to (1) absorption of mois-
ture into the liberal dressing, which tends to
keep the burn surface dry, and to (2) im-
mobilization.

Recently he has made a departure from the
pressure-dressing method and resorted to
the "exposure method." The principles are:
(1) to expose the burn to daylight and cool
ward temperature, (2) to keep the raw area
dry, (3) to immobilize the part in order to
prevent invasion of the tissues by infecting
organisms, (4) to administer penicillin sys-
temically, and (5) to render nursing care as
simple as possible.

After standard methods of cleansing have
been applied, the burn is dusted with peni-
cillin powder, which is repeated every four
hours for the first 24 hours and thereafter
when necessary. Cultures are taken on ad-
mission and daily for the first four days, at
which time the coagulum is usually dry.

The burns treated thus have been mainly
superficial and moderate in extent. Further
trial is required for deep burns, but the au-
thor's experience leads him to suggest that
they can be treated by this method.

Edtiorial Comment: Several similar meth-
ods of managing burns have been tried in the
past. In this country, records of thousands
of burn cases under controlled studies still
indicate that the pressure-bandage method
offers simplicity in management, comfort to
the patient and uniformly better results than
open methods of treatment except perhaps
in small superficial burns.

Braithwaite, F., and Moore, F. T.: Some
Observations on Anaemia in Patients
with Burns. *Brit. J. Plast. Surg. 1:* 81,
July, 1948.

The importance of the nutritional factor,
especially protein depletion, in anemia re-
sulting from burns, is emphasized by
Braithwaite and Moore. They find that the
anemia arising from burns with greater than
15 per cent skin loss is extremely persistent
and reacts only to transfusions of whole
blood. The anemia will not be relieved until
the burn is healed, and the burn will not heal
until the hemoglobin is over 60 per cent.

The anemia which develops after the initial stage of hemoconcentration has passed, i e , after the first four or five days, is related, in time, to the period of excessive protein catabolism, and may be due to depression of hemoglobin synthesis The main protein loss is related to the burn surface Treatment should be directed to breaking this vicious cycle by raising the hemoglobin by blood transfusion and compensating for protein loss by a high protein diet

Brown, W. A , Farmer, A W , and Franks, W. R Local Application of Aluminum Foil and Other Substances in Burn Therapy *Am J Surg 76* 594, Nov 1948

In an effort to improve local burn treatment Brown and his associates present their experience with the use of aluminum foil, 001 inch in thickness In the use of pliable, finely permeated metal sheet, they were most interested in avoidance of the influences of maceration, which may possibly damage areas with only scanty epithelial remnants Burns treated with foil, then covered with the usual pressure dressing, were usually dry, odorless and presented very little exudate as compared with the reaction found in vaseline treated sites The authors felt that the systemic reaction was less when foil was applied locally

They also report the use of titanium dioxide exposure cream, which was irritating and probably delayed healing The use of ascorbic acid locally resulted in rapid absorption but no significant improvement Determination of blood glutathione levels in thermal burns was found not to be particularly applicable in burn management

Urkov, Joseph C The Critically Burned Child *Am J Surg 76* 821 June, 1948

In Urkov's opinion, burns of wide expanse in children, due to frequent occurrence, necessitate singular attention in management This is especially true since the child has so little extremity skin available as donor sites The author outlines a program of management including primary systemic therapy and preparation of the surface for grafting He feels that the extent of the lesions justifies the frequent use of homografts in order to control systemic disturbances and improve the local lesion, followed later by a pro-

cedure of autografting to cover the remaining defect after the homografts have melted away

Editorial Comment This procedure seems to prolong the care of these children unnecessarily and would tend to increase the degree of resultant burn contracture and healing problems

HYPOSPADIAS

Irazú, J , and Nikilson, J Hypospadias The Collaboration of Plastic Surgeon and Urologist (Hipospadias La colaboración del cirujano plástico y del urólogo) *El Día Médico 20* 1156, 1948

Hypospadias as viewed by Irazu and Nikilson, is a genito urinary deformity which must be corrected by plastic reconstruction The patient does not consult the plastic surgeon but the urologist Therefore, the latter is the one who ought to have the idea of collaboration, on the basis of a modern understanding of the treatment

The urologist has to make a thorough examination of the patient investigating other possible alterations in the genito urinary system, as cystitis, uretritis, ectopy and in fantilism He might add urethrography and besides be prepared to perform perineal urethrostomy or cystostomy, and ligation of the cavernous urethra, furthermore he can be an experienced assistant in the reconstructive operation In the postoperative period he has to see that the cystostomy works properly and he must prevent or treat the urinary complications which might appear The plastic surgeon brings to the task his knowledge in the reparative plastics as he knows how to deal with flaps dissection of tissues and to choose proper lines of cleavage His experience qualifies him to judge the nutrition of a pedicle flap, the advisability of a debriding incision and how to make fine sutures He is the only one who can properly handle the special instruments and the suture in the reparative surgery Plastic surgery consists of small important details which are the secret of success in any operation specially when the procedure requires free grafts of flaps For the experienced urologist there will be 100 per cent possibility of curing the urological part of the treatment in a patient with hypospadias Instead as a plastic surgeon, he will have slight chance of success, even if he has had

proper training without the necessary experience.

NEW GROWTHS

Edmundson, W. F.: Microscopic Grading of Cancer and Its Practical Implication. *Arch. Dermat. & Syph. 57:* 141, Feb. 1948.

Edmundson discusses the advantages of grading malignant tissue according to Broders' classification, as well as the basis for grading. The grade of malignancy is based, broadly, on the fact that among growths there is individuality, depending on the type of tissue from which the neoplasm has sprung, the site of growth, the type of its growth and, as is most important, the degree of differentiation and dedifferentiation (anaplasia) of the cells of the tumor. It is from this last concept that the weight of evidence for grading is drawn.

Broders listed the average grades of malignant tissue in various locations, noting that in the lip the average grade was 2.07 and in the skin 2.19. He listed the average grades in consecutive cases in which metastasis occurred, lip 2.65 and skin 2.93. The grades of malignant growths that did not metastasize were lip 1.88 and skin 2.10.

Concerning squamous-cell epitheliomas, the ones having high average malignancy are those of the tonsil, nasopharynx, posterior half of the tongue, esophagus, vagina and uterine cervix. Those tending toward low average malignancy are found on the anterior half of the tongue, buccal surface, cheeks, lips, skin, penis and labia. In general, carcinomas that metastasize are of higher grade than those that do not metastasize. Edmundson quotes Montgomery, who stated that in the treatment of squamous-cell epithelioma of the lip, grades 1 and 2 may be treated with excision and diathermy with good results (10 per cent recurrence—Broders). Grades 3 and 4 have a poor prognosis after excision of, and radiation applied to, the glands (10 per cent successful—Broders) because metastases are usually present.

The author concludes that the grading of carcinoma according to Broders' method is the best basis for classification of malignant tumors yet suggested for practical purposes in relation to clinical values. He feels, however, that the whole system of nomenclature of tumors should be revised to lead to better understanding and accuracy.

Tice, G. M., and White, C. M.: Skin Cancer. *Kansas Med. Soc. J. 49:* 321, Aug. 1948.

According to Tice and White, the chief etiological factor in skin cancer seems to be chronic irritation from such agents as coal tar products, actinic rays, weather and uncleanliness. Their study is based upon 358 cases of cancer treated at the University of Kansas Hospital from 1933 to 1945. The higher incidence of skin cancer in the Southern states is cited as evidence of the part played by actinic rays in the causation of skin cancer. In Fort Worth and Dallas, 46 per cent of all cases of cancer are primary in the skin, while in Chicago this figure is 12.5 per cent. The authors are impressed with the number of skin cancers occurring in blond workers in the wheat fields of Kansas.

The treatment recommended is surgery, radium or roentgen rays or a combination of the three. Basal-cell epithelioma showed a cure rate of 95.2 per cent, squamous-cell epithelioma 79.7 per cent, and the over-all cure rate was 90.5 per cent. The massive type of roentgenotherapy is recommended.

Mohs, F. E.: Chemosurgical Treatment of Cancer of the Skin. *J. A. M. A. 138:* 564, Oct. 23, 1948.

A "chemosurgical" technic, as used in the microscopically controlled excision of cancer of the skin, is described by Mohs, and the results in 814 cases are analyzed. This method makes possible the selective destruction of skin cancer with the advantages of reliability and conservatism.

The technic includes the following steps: (1) Chemical fixation *in situ* of the tissues suspected of being cancerous by means of a paste containing zinc chloride; (2) excision of a layer of the fixed tissue; (3) location of the cancerous areas by systematic microscopic examination of the excised tissues; (4) further chemical treatment limited to the areas demonstrated to be cancerous, and (5) repetition of the process until the cancer, including all its irregular extensions, has been entirely excised. The fixative chemical itself has no selective action.

The advantages of this method mentioned by the author are its reliability, conserva-

tism, low mortality, and efficiency in removing irregular outgrowths of cancer which are not initially demonstrable by the most careful clinical examination. The reliability of the method is due to the microscopic control which makes it possible to follow the irregular extensions from the main tumor mass.

Successful results were obtained in 97 per cent of the 458 determinative cases of basal cell carcinoma observed for 3 years or more, and in 96 2 per cent of 291 cases observed for 5 years or more. For squamous cell carcinoma the rate of cure was 85 6 per cent of 222 cases in the three year period and 84 4 per cent of 136 cases in the five year group.

DeWeese M S Extraocular Malignant Melanoblastoma *J A M A, 138* 1026, Dec 4 1948

Experience with malignant melanoblastoma at the University of Michigan Hospital from 1931 to 1948 is summarized by DeWeese. The five year arrest rate was 25 4 per cent. All patients but 7 9 per cent later died of metastases. There were no ten year arrests.

Three patients were children one 2 and 7 years of age. The lesions in these 3 cases all resembled typical nevi and showed some clinical evidence of activity such as recent increase in size or tendency to bleed. Excisions were done with no metastases after two four and twelve years respectively.

Twenty nine per cent of the malignant lesions originated in cutaneous tumors which had not been recognized as nevi or as potentially dangerous. Many had been treated by various forms of cautery without previous biopsy and with uniformly disastrous results. These atypical lesions were frequently ameloanotic and were variously described as "blood blisters," hard nodules persistent pimples " ' warts, nonpigmented papillomas " or pigmented scars from previous trauma " There were five ulcerating or fungiting lesions of the feet which followed trauma and had failed to heal.

The principles of treatment are discussed with the following suggestions. For prepubertal melanomas simple excision without prophylactic dissection of nodes and followed by periodic observation. Roentgen therapy is not recommended in any type of melanoma. Any tumor of the skin of uncertain causation regardless of the degree of pigmentation should be removed by wide surgical excision. If it is subject to repeated trauma or shows signs of clinical activity. When feasible the principle of ' excision and dissection in continuity," as outlined by Pack and his associates should be followed. In peripheral lesions too far removed from the regional nodes to make this practical, the primary lesion may be widely excised or the digit amputated if no nodes are demonstrable. After a period of about 6 weeks to allow free cells to reach the nodes, a radical dissection of the regional nodes should be done. In cases of local recurrence of regional node metastases the radical procedures advised by Pack and his associates are justified.

Braithwaite, Fenton Melanosis of the Eyelids *Brit J Plast Surg 1* 206 Oct 1948

Two interesting cases of melanosis of the eyelids are discussed by Braithwaite. The premalignant nature of acquired melanosis is well established.

In Case 1 melanosis occurred in the fifth decade. It became malignant within a 10 year period. Original pigmentation (slate gray) appeared in the eyelid. Pigmentation had spread widely and at times its limits varied. Biopsy showed a melanotic carcinoma with typical areas of hydropic degeneration. The tumor responded to a combination of radiation and surgery. A wide area of pigmentation disappeared after a treatment which remained confined to the lower lid.

Case 2 is an example of congenital melanosis of the eyelids. Original pigmentation was diffuse and not elevated above the surrounding skin and covered an extensive area. The lesion was originally biopsied in 1911 and showed a high degree of potential malignancy. Histological sections made 7 years later showed melanotic sarcoma. Clinical behavior over a 7 year period suggests a low degree of malignancy. Growth of the lesion followed a severe blow on the eye by a hard rubber ball.

The author concludes that acquired melanosis of the eyelid is precancerous and its appearance should be treated by surgery or radiation or both. Congenital blue nevi may become malignant or may become locally invasive and should be excised in childhood.

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SURGICAL TREATMENT OF ELEPHANTIASIS OF THE LOWER EXTREMITIES*

T G BLOCKER, JR , M D

Elephantiasis is a type of gravitational edema superimposed upon chronic obstruction of the lymphatics, aided and abetted by repeated bouts of acute infection Dependent portions of the body involved are, in the order of frequency, the lower extremity, arm, and genitalia Primary types have as the underlying pathology congenital dilatation of the superficial lymphatics and sclerosis of the larger lymph trunks, even extending as high as the iliac nodes. Lesions usually classified as hereditary edema (Milroy's disease) and idiopathic (lymphedema praecox according to Allen's classification) may actually exist as the same clinical entity, differing only in the degree of involvement of lymphatic structures with the more severe cases presenting themselves as developmental anomalies Others which appear during childhood, adolescence, or even later may perhaps be occult for a number of years and be made manifest when decompensation occurs from the effects of gravitational edema, the strain of rapid growth, or perhaps an intercurrent infection

Secondary obstruction of the lymphatics occurs as the result of (1) mechanical blockage from any cause (benign and malignant tumors, excessive scarring, invasion by cancer cells, plugging of lymphatics by filaria, etc), (2) sclerosis from X-ray and radium therapy, and (3) chronic infectious lymphangitis following thrombophlebitis or invasion by pathogenic organisms from lesions of the skin

Consensus of opinion at present is that the chief function of the lymphatics is the removal of protein and particulate matter which cannot be readily absorbed into the venular portion of the capillaries If the subcutaneous lymphatics are blocked per se or by overgrowth of connective tissue there collects extravascularly an accumulation of highly proteinized fluid which because of local increase in osmotic pressure invites further edema formation Most workers with the exception of Drinker, who first produced elephantiasis in experimental animals in 1934, feel that repeated infection is necessary to the development of the condition All agree that tissues involved in lymph stasis are peculiarly prone to attacks of recurrent cellulitis and lymphangitis with hemolytic strep tococci as the predominating organisms, and that inflammation hastens the fibrosis of subcutaneous tissue and hypertrophy and brawny induration of the skin which are characteristic of full blown elephantiasis In spite of the fact that lymph nodes are concerned with antibody formation, the tissues of the lower extremity have poor natural resistance to infection since antibodies do not pass easily through the capillary membrane, like the smaller albumin molecules. Pathogenic organisms may be dormant for long periods of time, giving rise spontaneously to flare-up of localized or even bloodstream infection

MISCELLANIES

Ragnell, A.: Breast Reduction and Lactation. *Brit. J. Plast. Surg. 1:* 99, July, 1948.

In Ragnell s opinion, the lactational capacity of hypertrophic breasts has been considerably underrated. Of 56 unoperated women with this condition, 32 suckled satisfactorily and only 2 not at all.

The preservation of lactation following surgery depends on the retention, intact, of as many glandular lobules as possible. The resection should therefore be performed in the superior central portion and should be sectoral in shape. Whereas it must be subtotal in the central parts, to avoid injuring the milk ducts from the retained glandular lobules, it may be total in the outer parts. If necessary, a crescent-shaped excision may be performed around the lower part at the second stage. Of 12 women who became pregnant following operation by the conservative two-stage method, 9 were able to suckle satisfactorily.

Transverse amputation of the breast with free grafting of the nipple makes lactation impossible. It should be confined to cases in which there is no possibility of pregnancy, or lactation has been absent in previous pregnancies.

Editorial Comment: The data presented in this article are of more than ordinary interest and value because of the extensive follow-up of cases, not possible in the large cities of the United States, with their floating population. The high percentage of lactational function reported in the hypertrophic breasts in this series (60.7 per cent) is in strong contrast to the lack of function usually ascribed to this condition. Equally striking is the amount of satisfactory lactation (75 per cent) in operated patients. This is probably more than in women with supposedly normal breasts in this country !

The proportion of retained erotic sensibility in the nipple would be a valuable addition to the material contained in this article. In view of the high degree of lactational function, it is safe to assume that the sensitivity of the nipple remained intact or only slightly diminished in a large proportion of cases. This confirms that reconstruction of the hypertrophic breast by the two-stage procedure of transposition conserves a high degree of physiological function.

Baxter, H., Entin, M. A., and Drummond, J. A.: Progressive Lipodystrophy. *Canad. M. A. J. 59:* 452, Nov. 1948.

As stated by Baxter and his associates, in progressive lipodystrophy there is some bilateral symmetrical loss of subcutaneous fat in the upper portion of the body. This frequently commences in the first decade of life and is very insidious in onset. It is more common in females than in males. Laboratory investigation is negative. Examination of the tissues yields nothing positive, except loss of fat. The etiology is not understood. There appears to be no specific general therapy. The condition is self-limiting and progresses no further when all the fat has been lost from the upper part of the body. The local treatment in 3 cases is reported. The subcutaneous regions of the face were filled out with dermis and fat grafts in 2 cases, and fat and fascial grafts in the remaining case.

Editorial Comment: This is an excellent resumé of the condition of progressive lipodystrophy.

SURGICAL TREATMENT OF ELEPHANTIASIS OF THE LOWER EXTREMITIES*

T G BLOCKER, JR , M D

Elephantiasis is a type of gravitational edema superimposed upon chronic obstruction of the lymphatics, aided and abetted by repeated bouts of acute infection Dependent portions of the body involved are, in the order of frequency, the lower extremity, arm, and genitalia Primary types have as the underlying pathology congenital dilatation of the superficial lymphatics and sclerosis of the larger lymph trunks, even extending as high as the iliac nodes Lesions usually classified as hereditary edema (Milroy's disease) and idiopathic (lymphedema praecox according to Allen's classification) may actually exist as the same clinical entity, differing only in the degree of involvement of lymphatic structures with the more severe cases presenting themselves as developmental anomalies Others which appear during childhood, adolescence, or even later may perhaps be occult for a number of years and be made manifest when decompensation occurs from the effects of gravitational edema, the strain of rapid growth, or perhaps an intercurrent infection

Secondary obstruction of the lymphatics occurs as the result of (1) mechanical blockage from any cause (benign and malignant tumors, excessive scarring, invasion by cancer cells, plugging of lymphatics by filaria, etc), (2) sclerosis from X ray and radium therapy, and (3) chronic infectious lymphangitis following thrombophlebitis or invasion by pathogenic organisms from lesions of the skin

Consensus of opinion at present is that the chief function of the lymphatics is the removal of protein and particulate matter which cannot be readily absorbed into the venular portion of the capillaries If the subcutaneous lymphatics are blocked *per se* or by overgrowth of connective tissue there collects extravascularly an accumulation of highly proteinized fluid which because of local increase in osmotic pressure invites further edema formation Most workers with the exception of Drinker, who first produced elephantiasis in experimental animals in 1934, feel that repeated infection is necessary to the development of the condition All agree that tissues involved in lymph stasis are peculiarly prone to attacks of recurrent cellulitis and lymphangitis with hemolytic streptococci as the predominating organisms, and that inflammation hastens the fibrosis of subcutaneous tissue and hypertrophy and brawny induration of the skin which are characteristic of full blown elephantiasis In spite of the fact that lymph nodes are concerned with antibody formation, the tissues of the lower extremity have poor natural resistance to infection since antibodies do not pass easily through the capillary membrane, like the smaller albumin molecules Pathogenic organisms may lie dormant for long periods of time, giving rise spontaneously to flare up of localized or even bloodstream infection

Since the entire circulatory mechanism of the extremity is concerned in patients with elephantiasis, it would seem logical to remove as much diseased tissue as possible, replace it with healthy skin, and guard against further gravitational edema by the use of supportive stockings or dressings and efforts to encourage restoration of normal tone in the leg muscles, which have become flabby through lack of normal activity. This has been the treatment of choice for a number of years for the relief of chronic gravitational ulcers, which are surrounded by an area of devitalized, indurated, and atrophic skin, firmly attached by scar tissue to the underlying tissues.

Procedures which attempt to open up new lymph channels by the insertion of threads of silk or other material (Handley) are unsound in that eventually

FIG. 1

M A K.   White female, aged 48. Lymphedema, five years duration

a (Left) Preoperative   b (Right) 2 years postoperative

they result in increased formation of scar tissue. Attempts to provide "bridges" by means of pedicle flaps for lymph flow from the thigh to the abdomen or chest are likewise unphysiological. The Kondoleon operation with its various modifications has been the most popular type of surgical procedure for treatment of elephantiasis in this country in spite of the fact that its underlying theory of establishment of communication between superficial and deep lymphatics is no longer felt to be tenable. Homans pointed out that in the recumbent position drainage of large amounts of edema fluid is accomplished by gravity through the dilated superficial lymph spaces and eventually into the general circulation. He felt that good results by the Kondoleon-Sistrunk technique were due to the removal of a certain amount of tissue and himself advocated the excision in

Fig 2

I M I White female aged 15 Lymphedema right leg, seven years duration
a Preoperative
b Eighteen months postoperative
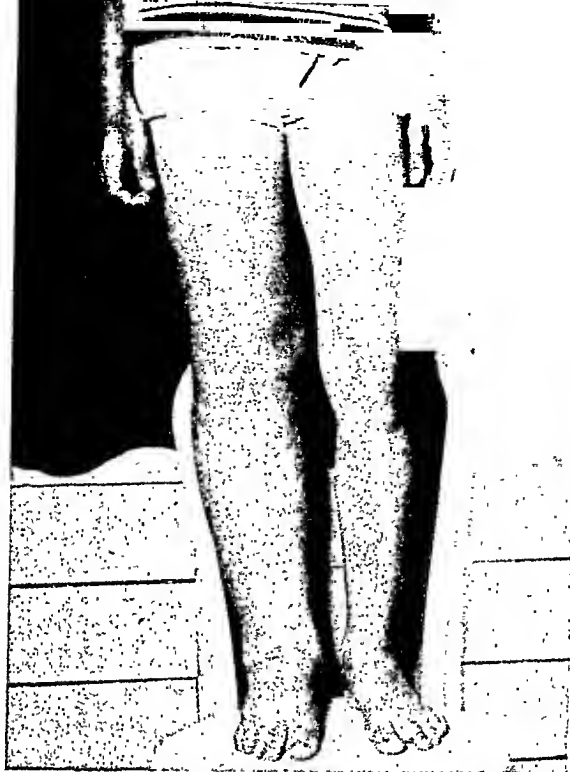
Fig. 3

E.S.: White male, aged 11. Lymphedema, right leg, one years duration.
a. Preoperative.
b. Photograph at operation.
c. Appearance after one year.

stages of as much subcutaneous tissue as possible, leaving a thin skin flap as cover over the deeper structures of the leg. Ghormley and Overton in 1935, reporting a large series of Kondoleon operations at the Mayo Clinic were of the opinion that proper post-operative support was a most important factor in obtaining successful results since on follow-up studies real improvement was found in 72% of patients who wore elastic dressings after operation but in only 40% of those who did not.

In 1940 Macey advocated a new operation for elephantiasis, which consisted

Fig. 3 c

of peeling back affected skin and subcutaneous tissues on half of the leg at a time, and applying thick-split grafts on the denuded areas. The overlying pad of tissue was then sutured in place to serve as a sort of pressure dressing for a period of ten days and then trimmed away. This technique was modified by Bunnell for use in the upper extremity by excision in two stages of "the thickened tissue external to the deep fascia" and coverage with split-grafts. Poth described the same procedure for the lower extremity below the knee, using a one-stage operation and excising all tissue except a narrow strip covering the tibia anteriorly.

Poth's modification of Macey's technique with a few changes has been employed by the writer in six cases. After two weeks preoperative bed rest with the leg elevated the skin and subcutaneous tissues are removed completely with the exception of the toes, the sole of the foot, and a very small covering over the heel cord. Calibrated grafts are cut with the dermatome from the skin which has been removed unless it appears atrophic or is involved in an inflammatory process; these are supplemented by grafts from the thigh, chest, or abdomen. A tourniquet is employed, and bleeders are secured with #38 stainless steel wire. Grafts are sutured accurately in place and covered by pressure dressings over gauze saturated with 1:4000 zephiran in glycerine. With the knee in slight flexion, a cast is applied and left in place for five days until the first dressing. The patient is kept at complete bed rest for approximately 60 days and allowed up only when the extremity maintains good color when held in the dependent position. Meanwhile massage, passive motion and active exercises are instituted as aids to the improvement of circulation and the restoration of muscle tone.

In one patient with idiopathic elephantiasis, operation included an area from the mid-thigh region to the toes. This procedure was only slightly more tedious than the less extensive one, and results up to the present time have been so gratifying that this technique will be considered in future cases.

CASES

M. A. K.: White female, aged 48. At age of 42, two months following an appendectomy, this patient developed spontaneous painless swelling of the entire right leg and thigh with gradual progression of symptoms and three or four episodes of cellulitis and acute lymphangitis. On February 3, 1947, all the skin and subcutaneous tissue from the knee to the ankle were excised *en masse*, and the raw surface was covered with thick split-grafts. Post operative course was satisfactory. On June 26, 1947, the foot from the toes to the ankle was similarly treated. The patient has cooperated in wearing elastic supportive dressing continuously, and her present condition is satisfactory in spite of the fact that there has been little reduction in the size of the thigh.

C. E.: Colored male, aged 59. At age of 33 following several months in bed for typhoid fever this patient developed spontaneous edema of the right leg, followed by chronic ulceration which persisted for 25 years. During this period he had been completely incapacitated except for occasional odd jobs in the winter months when the edema subsided partially. When first seen he showed typical changes of elephantiasis below the knee and two large gravitational ulcers. At operation on July 2, 1947, all involved tissue was excised from the knee to the toes and discarded. Raw surfaces were covered with dermatome grafts from the thighs. A small area which failed to take was re-grafted the next month. The patient did well until January 1948, when a small area of breakdown occurred from failure to wear his elastic stocking. It healed spontaneously on two weeks bed rest.

I. M. I.: White female, aged 15. At the age of 1 year this patient developed spontaneous redness, swelling, and cellulitis of the right leg which recurred at intervals of three to six months, each attack lasting from a few days to two weeks. Irreversible edema began at the age of 8 and progressed until on admission the right thigh was two inches larger than the left and the calf three inches larger. Skin color was normal, and no infection was evident at the time of operation. Following operation on August 1, 1947, a secondary touch-up procedure was performed seven months later to smooth out bulging of the skin in the ankle region at the lower extent of the skin graft. On September 3, 1948, when the patient reported

for examination, her condition was remarkably good and she reported that she was able to play volleyball and basket ball without ill effect

V R This 57 year old white male developed in 1930 at age of 40 swelling and ulceration of the right leg following local infection of unknown etiology Lesions failed to heal Seven years later edema and ulceration of the left leg appeared as a result of dog bite of the calf Patient was kept at bed rest for one month, during which period he was treated for a moderate iron deficiency anemia believed to be secondary to chronic infection, and for prostatism with urethral stricture Operation on the left leg was performed on August 28, 1947, *on the right, October 2, 1947 Both healed with 100% take No follow up has been obtained as yet*

E B Colored male, aged 29 This patient received severe burns of both legs and thighs *at the age of 3 Two years prior to admission a large circular ulcer appeared on the left leg, following minor trauma, accompanied by considerable hypertrophy and edema O   D*

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E S White male, aged 11 Spontaneous painless swelling of the right foot began one year previously, gradually progressing until the entire leg and thigh were involved It had been noted that edema decreased somewhat on bed rest At the time of operation the legs showed two inches difference in size between the thighs and three inches between the calves On July 27, 1948 skin and subcutaneous tissue were excised from the mid thigh to the toes, (with the exception of the popliteal space) and raw areas were covered with skin grafts from tissue removed as well as from the abdomen On August 27, 1948 a few granulating areas left from the first procedure were covered with small strips of skin fitted into the defects The patient was kept in the hospital for three months for rehabilitation Condition was excellent on discharge and no break down has occurred

CONCLUSION

Elephantiasis of the lower extremities, like many another surgical problem, is more satisfactorily treated by preventive measures wherever possible than by operation Too little emphasis has been placed upon the role which gravity plays in the development of progressive lymphedema of every variety Lymphatic obstruction in itself is not so much to be dreaded as the loss of circulatory equilibrium of the affected limb Tissues which are deprived of their proper blood supply inevitably become vulnerable to trauma and infection The most physiological approach to the surgical treatment of elephantiasis at the present time appears to be the removal of skin and subcutaneous tissue *en masse* down to the uppermost layer of muscles and the periosteum of the tibia, coverage with large thick split dermatome grafts, and indefinite elastic support for protection against injury and to prevent the inevitable pathological changes which recurrence of gravitational edema would entail

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E S White male aged 11 Spontaneous painless swelling of the right foot began one year previously gradually progressing until the entire leg and thigh were involved It had been noted that edema decreased somewhat on bed rest At the time of operation the legs showed two inches difference in size between the thighs and three inches between the calves On July 27, 1948 skin and subcutaneous tissue were excised from the mid thigh to the toes (with the exception of the popliteal space) and raw areas were covered with skin grafts from tissue removed as well as from the abdomen On August 27 1948 a few granulating areas left from the first procedure were covered with small strips of skin fitted into the de fects The patient was kept in the hospital for three months for rehabilitation Condition was excellent on discharge and no break down has occurred

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EXPEDITIOUS USE OF DIRECT FLAPS IN EXTREMITY REPAIRS[1]

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Io 1945, with Dr. Barrett Brown, we reported on the use of direct flaps to the arm and hand as a rapid method of completing the resurfacing of areas of scar for better protection of underlying structures or in preparation for definitive deep surgery (1) Two years ago we reported on the use of open jump flaps from the abdominal wall to expedite the completion of large repairs of the lower extremity (2) Our enthusiasm in the latter report has been corroborated by a comparative statistical analysis, by Edwards (3), of a series of open jump flaps with other types of flaps used for similar repairs Not only is the time consumed for the repair less but the incidence of failure using the open jump flap was less than with the other types of flap

As plastic surgeons, it is incumbent on us to continue to emphasize to ourselves and to our surgical colleagues the importance of hastening and simplifying the surgery of reconstruction without jeopardizing the result In tracing the history of general surgical procedures in the past several decades, one finds that many two stage operations were recommended because of earlier bad results with a one stage operation Today, with improvements in anesthesia, control of infection and better pre- and post-operative care, these same operations are being done again successfully in one stage The plastic surgeon should follow this trend

One is handicapped in expediting plastic surgery because so many of the procedures must be done in several stages However, there are methods available to us which will reduce the time consumed in completing a repair and, consequently, they should be utilized wherever possible The purpose of this paper is to cite some of the direct methods which have been used successfully in the transfer of flaps for surface repairs of the extremities

In evaluating the best method for any extremity surface repair, the sequence of choices is usually (1) excision of the scar and closure, (2) resurfacing with a free skin graft if the underlying tissue is sufficiently vascular to accept the graft, (3) shifting of single or double pedicled local flaps as either direct or delayed flaps and (4) transfer of remote flaps In the majority of extensive repairs, necessitated by previous major deep trauma, the use of a remote flap is the most rapid and effective method of securing a satisfactory result

The primary indication for the use of a flap is to replace superficial and deep scars with normal skin and subcutaneous tissue Such replacement is of the

greatest importance for better protection over bony prominences, for replacement of unstable scar tissue, and for healthy tissue through which to carry out definitive deep repairs to bone, tendon and nerve.

By planning the flap with a sufficiently broad pedicle, repairs can be completed in two operations, about three to four weeks apart. Even large retrograde flaps of the lower extremities can be used safely, if provided with an adequately broad base. Only if the defect is extremely large or of such a shape that a direct flap is unsuitable must the flap be delayed. It is seldom necessary to delay a flap to the

Fig. I. Direct flap repair for extensive soft tissue and bony loss of upper arm preliminary to bone grafting of humerus Functions of hand and forearm not impaired. (From Surgical Clinics of North America, October 1947.)

upper extremity at the time of transfer. Delays in detaching a flap are necessary only if the pedicle itself is to be utilized for a part of the resurfacing.

In preparing an area to receive a flap, as wide an excision of surface scar as possible is done. The dissection of the damaged skin and subcutaneous scar is carried into normal tissue to remove all possible avascular fibrous tissue and to provide a good attachment for the flap. Some of the normal skin may be sacrificed to secure a healthier attachment for the flap. Skin may also be sacrificed to displace suture lines, joining the skin and the flap, away from normal lines of tension so that the scar will not restrict motion. Occasionally important undamaged parts of the extremity, such as tendon or nerve, whose function is impaired by the scar may be encountered. These can often be dissected free and, for the sake of better nutrition and mobility, imbedded in the fatty tissue on the under surface of the flap.

The donor area from which the flap is raised can be better cared for if it is closed with a split skin graft immediately. This phase in the preparation of a flap has been emphasized by Macomber (4). There may be difficulty in applying a fully satisfactory dressing on the graft but even with the rare partial loss of the graft, the reduction in area of raw surface and consequent greater cleanliness of the wound is advantageous. The risk of damage to the flap by infection or thrombosis is reduced and when the flap is detached, both wounds can be safely closed primarily.

Surgical delays in detaching the flap are necessary if the new blood supply has developed slowly from the surface to which the flap is applied. Evaluation of the condition of the circulation can be made by temporary compression of the pedicle or other similar tests. Delays may also be desirable to increase the effective size of the flap for covering additional surfaces inaccessible at the primary procedure. Should the flap be edematous and the circulation doubtful, all sur-

Fig. II. Direct flap repair of unstable scar above external malleolus. No deep surgery indicated or contemplated.

gery should obviously be postponed a few days. This condition is unusual unless the wound has been neglected and infection has occurred. An often difficult decision to make is whether to close the wound after detaching the flap. An ill timed or ill-executed closure may result in a marginal slough that will reduce the value of the repair. The average time for attachment of these flaps is three weeks but some can be detached as early as 18 days and others must remain attached as long as four weeks. Little is gained by severing the pedicle too hastily. Final decision about severing the pedicle is best made by examining the condition of the flap.

Types of fixation vary with the site of the repair. In general, it can be said that all upper extremity flaps from the abdominal or chest walls can be secured adequately with adhesive strapping. For the lower extremity, fixation is more complex because the legs cannot be placed in a natural position and, consequently, must be supported as well as immobilized. This usually necessitates the use of a rigid splint rather than adhesive strapping. A plaster cast is the method most commonly used, but others, including plexiglass (5), have been suggested. Care

Fig. III. Direct flap replacement for healed skin graft over os calcis. Graft stable but painful because of absence of soft tissue padding between skin and bone. Adequate padding provided by flap.

Fig. IV. Direct flap replacement for healed skin graft on sole of foot. Skin and subcutaneous tissue deeply avulsed. Wound closed with a skin graft. Additional protection necessary for metacarpal heads.

must be taken to be sure that the pedicle of the flap is not compressed or kinked by the overlying leg when a cross-leg position is necessary. There is also danger

of pressure on the skin and subcutaneous tissues of the underlying leg even if the pedicle of the flap does not lie beneath it

The flap itself is protected and supported by a firm, resilient dressing so arranged that the pedicle is not compressed and the flap can be easily inspected at intervals in the immediate post operative period Such an inspection will often reveal alterations in the normal circulation to the flap that are still correctible Cotton mechanic's waste is an ideal medium for the dressing since it provides resiliency and can be teased aside to permit the inspections without disturbing the dressing as a whole Interpretation of the color of the flap is most important Seldom does a flap fail because of inadequate arterial supply The normal arterial pressure is usually sufficient to pump blood into flap a but if the pedicle is kinked or inadequate, the venous outflow at a much lower pressure may be impeded Persistent bluish discoloration of a flap, due to venous congestion, is often a grave sign of impending necrosis

After complete healing, a flap on the lower extremity, and even one on the upper, should be supported by a firm dressing until normal circulation is fully re-established This may take from six months to a year In extreme instances, the life long wearing of support may be required The absence of sensation in the skin of a flap calls for the avoidance of unnecessary trauma to the skin and protection against it Conscientious examination and care of the anesthetic surface by the patient is essential for final success Sensory and vasomotor functional recovery progress at roughly the same rate and the recovery of these is a good guide to the desirable duration of protection and support

SUMMARY

A plea is made for the use of direct methods wherever possible in extremity repairs In this way hospitalization is reduced, fewer operative procedures are necessary, definitive deep surgery can be undertaken earlier, and the results are equally as satisfactory as with multiple stage procedures Some of the direct methods that have been used are illustrated

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THE TREATMENT OF RECURRENCE OF CANCER OF THE BREAST

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According to Pickrell, Kelly, and Marzoni, about one-third of the cases operated upon for cancer of the breast have local recurrences. (1) At the same time there is a tendency quite general among surgeons over the country to refuse further surgical aid, because they offer a less favorable outcome than did the original cases. In our own group of 157 cases, there shows about the same percentage of recurrence (29.9%). Of the total of 163 cases, six had recurrence in the sternum, or 3.68%, and these were operated. With the development of plastic surgery, many of these cases heretofore considered as belonging to the "inoperable" group have become operable. Some of the cases below preceded the plastic surgery era, but by the same token, the longer the time which has elapsed since surgery, the better the end results can be compared. Pregnancy, or lactation, should not discourage the surgeon if there are no other signs of cancer present.

The following six cases make up the author's complete list of cancer metastases of the sternum and ribs observed as complications in the total of 163 cases of cancer of the breast:

CASE I. *Mrs. A. M., age 36*

Two months postpartum, in 1911, patient had a radical mastectomy by the author. This consisted of removal of pectoral major muscle and dissection out of the axilla. The tissue removed was pronounced "cancer of the breast", by Dr. A. W. Crane and Dr. J. B. Jackson of Kalamazoo. Three years later, in 1914, there was a recurrence at the site of the former breast operation. This consisted of a "lump" near the sternum between the fourth and fifth ribs on the left side. There was no x-ray or clinical evidence of other recurrences present.

Operation April 21, 1914, consisted of removal of about two inches each of the fourth and fifth ribs, including parietal pleura. Pneumothorax ensued but this disappeared spontaneously in about ten days. (No positive pressure was available in those days; further, it was thought there was a better wound healing when negative pressure was avoided.) Primary union resulted in the approximated edges of fat and skin. No postoperative x-ray treatment was given.

There has been no x-ray or other evidence of recurrence since, and a letter from the patient in December, 1938, declares that she was well and her local doctor, who had recently examined her, found no evidence of cancer.

CASE II. *Mrs. W. F. H., age 56*

Radical operation by the author, August 16, 1918, with removal of major, but not minor, pectoral muscle, and dissection out of the axilla. This was followed by 340 r. units of x-ray treatments.

Recurrence March 1922, four years after initial operation, and first observed when six weeks old. The recurrence showed by x-ray as a small egg-sized nodule, mostly intrathoracic, and involving the sternum. No other involvement showed by x-ray. Operation of recurrence was done April 18, 1922, included removal of parts of the second, third, and

fourth ribs, and part of the sternum Diagnosis by Dr A S Warthin of Ann Arbor, Michigan, was "scirrhous metastasis" The only complication was empyema which lasted two or three months, then healed spontaneously and permanently X ray at this time was negative for metastasis elsewhere in the chest

Progress was excellent for two years, then she lost weight and strength, but had no evidence of local recurrence Late in 1925 she had a pathological fracture of the left trochanter, about two by five centimeters in size She died early in 1926 of malignant toxemia A post mortem examination showed no evidence of cancer other than the one in the left trochanter

CASE III *Mrs A H , age 57*

Lump removed from the left breast elsewhere in 1927 after its presence had been known for ten years After removal it was reported by Dr A S Warthin as 'non malignant'

CASE I Postpartum malignancy developed during lactation Three years later an intercostal recurrence was removed and no further sign of recurrence in thirty five years

A second lump appeared just below the scar of the first operation and was first discovered January 1, 1930 Another smaller one was discovered near by on the same date The former was hard and irregular, the latter was less so Simple mastectomy was done at first, and again at this time Dr A S Warthin reported 'adeno fibroma with cystic ducts No evidence of malignancy '

On March 3, 1941, she had observed a lump for two years It had grown very slowly and the only reason for coming in at all was that it had recently begun to 'sting' Examination showed a well nourished woman of 57 who had a weight of 140 pounds and blood pressure of 150/85 Between the fourth and sixth ribs on the left side was a small walnut sized nodule, with a smaller wheat kernel sized one median to it Grossly the tumor was a metastasis from cancer of the breast The mass was fixed and caused a deep dimple in the overhanging loose skin and fat No palpable glands in either axilla or the supraclavicular region were found The lung fields were clear and there was no x ray evidence of metastasis elsewhere

Thoracotomy left chest was done March 10, 1941 At that time there were removed the nodules, part of sternum, and parts of the three adjacent ribs Pathological report by Dr H R Prentice, local pathologist, was a 'scirrhous carcinoma Size of nodule suggests primary tumor rather than a metastasis"

September 21, 1942 a nodule was removed from near the incision and reported by Dr H

R. Prentice as "subcutaneous, metastatic scirrhous carcinoma". Normal chest and no evidence of recurrence shown by x-ray on February 1942, 1945, 1946, and 1947. There was a "metastatic lesion in the scar", reported by pathologist, and which was removed on February 14, 1945. No further recurrence after February 1945. Her latest check-up by x-ray on April 27, 1949, showed "no evidence of metastatic neoplasm or other change in the chest since previous examination. No evidence of metastatic neoplasm in lumbar spine or pelvis". This patient is free from cancer four years after last recurrence was removed and eight years after the original thoracotomy was done. There has been no x-ray treatment since thoracotomy.

CASE IV. *Mrs. E. T., age 63*

Left breast removed elsewhere in 1933. "Said to be cancer." Eight x-ray treatments were given soon after mastectomy. X-ray examination shows that the chest wall and spine were negative for recurrence on September 21, 1933.

Patient was first examined July 15, 1942, at which time she stated she had had a lump over the sternum for about a year.

CASE III: Showing how lesion looked before removal of part of sternum and parts of three adjacent ribs.

On this day, x-ray findings showed:
"1. Lung fields clear.
2. Multiple bony metastases in dorsal spine.
3. Metastatic mass involving anterior and superior margin of sternum but does not extend appreciably into the thoracic cavity."

Operation was done July 18, 1942, and consisted of resection of middle third of sternum, parts of the third, fourth, and fifth ribs and irrigation of the pleural cavity. Pneumothorax developed in spite of positive pressure anesthetic, but caused no untoward symptoms and cleared up in about three weeks. Pathological report by Dr. H. R. Prentice was "metastatic carcinoma".

On September 1, 1942, the right breast, with both pectoral muscles were removed and right axilla was dissected out on account of previously found tumor without axillary gland involvement. Uneventful recovery.

Recurrent nodules were excised November 6, 1942, and several more removed April 15, 1943. Patient then had a pathological fracture of the left humerus and soon after erosion of condyle of the left femur, head of left tibia, and destruction of right scapula. Patient died

of carcinomatous metastases on February 5, 1914 No x ray treatments were given since the right breast was removed August 21, 1933

CASE V. *Mrs. M. E. B*, age 56

This patient was first observed May 15, 1940 Her complaint was a growth in the right breast following an accidental elbow bump in August 1939 The lump began to discharge during December 1939, but still the patient thought she could do nothing about it because of her husband's last illness, which lasted three months The lump was sore but not painful She had lost ten pounds in weight The right nipple was ulcerated but there was no fixation to the chest wall or skin There was a definite lump the size of a walnut beneath the right nipple There were no palpable axillary or supraclavicular glands Radical operation on right breast, with removal of pectoral muscles and dissection out of axilla was done May 16, 1940, more than nine months late Pathologist reported "ulcerating Paget's disease in the deeper part of nipple and duct cell carcinoma of breast with metastasis in two of larger muscles" She had 7600 r units of x ray No 200 kilovolts and heavy filtration

Observation recorded as of March 7, 1941, there was "no evidence of recurrence in the axilla, supraclavicular region, or the skin The lungs were clear"

Patient was seen in the office on January 26, 1942, with complaint of urinary frequency and smarting In examining the site of the mastectomy on that date, some prominence was noted over the sternal end of the right third rib The mass, however, seemed soft and there was no discoloration

Patient returned on March 27, 1942, and reported that the urinary symptoms had subsided shortly after the previous call in January She came on this date largely because of the lump found on January 26th

On April 1, 1942, examination showed a mass about the size of an average sized olive over the right third rib at the sternal juncture It was soft but fixed to the rib There were no palpable glands in the axilla or in the neck

Operation on April 2, 1942, consisted of simple removal at first When pronounced malignant by Dr H R Prentice, a radical removal was done at once, under the same anesthetic, and included pectoral major muscle and dissection out of the axilla There was apparently no involvement of bone

On August 18, 1942, she came in because of the lump which she found on January 26, 1942 There were no subjective symptoms An examination showed an olive sized mass over the third rib at the sternal juncture There were no palpable glands in the axilla or neck Further examination showed a recurrence five centimeters long, two and half centimeters wide in the chest and sternum X ray showed "normal chest in frontal view Lateral view failed to show any film evidence of metastasis in the dorsal spine or sternum"

Operation was done August 20, 1942, and consisted of removal of mass with parts of third, fourth, and fifth ribs, and about one half of sternum on right side Uneventful recovery Negative x ray on September 7, 1942

On December 31, 1942, a nodule was found over the former incision made for the removal of part of sternum and three adjacent ribs It invaded the skin, but was movable and no nodule could be palpated over the remainder of the sternum or ribs About the same time the above nodule appeared there also appeared a rapidly growing lump in the *left* breast

Impression 1 Recurrence of cancer on the right side in the incision from the removal of sternum 2 Cancer of left breast X ray of December 31, 1942, showed "no growth metastatic breast region demonstrated" Examination disclosed a hickory nut sized lump immediately under the nipple of the left breast It was moderately tender It was well differentiated from the remainder of the breast It produced slight inversion of the nipple There was no discoloration in the skin and it was not attached to the chest wall

Radical operation done on left side with removal of major and minor pectoral muscles and axillary dissection Pathological report by Dr H R Prentice "Medullary carcinoma All nodes examined showed very cellular metastases"

Patient died of recurrence about 1945 No further details available

CASE VI. *Mrs. A. W., age 74*

Left breast removed elsewhere in 1925. Could get information that she had had a radical breast operation, but obtained nothing as to whether or not she had had x-ray treatments. Among six symptoms, the last one mentioned is the only one of importance. She asked if she should have an x-ray of her chest, although she had no local symptoms and she had made no mention of a hard, fixed mass over the sternum. The mass made a deep dimple in the skin and fat. This was clinically a malignant nodule and was fixed to the bony structures. It was about the size of an ordinary hickory nut, slightly red, but not tender, and neither open nor ulcerating. X-ray study showed: "No evidence, definitely, of metastatic bone lesion of dorsal spine, ribs, or sternum. Advanced general demineralization present. Retrosternal structures appeared to be normal as did the posterior of the sternum concerned".

April 26, 1942, had cautery knife removal of an urethral caruncle and a Buie hemorrhoidectomy. April 29, 1943, had a resection of the middle third of the sternum with about seven centimeters each of the adjoining third, fourth, and fifth ribs. The edges of the mediastinal pleura were sutured over the sternal defect.

Patient died suddenly the night after the operation, fifteen minutes after being seen by a competent nurse who reported the condition of the patient as normal for one who had had that type of operation. She had no other clinical evidence of cancer at any point.

RESUME OF THE SIX CASES

The first case, Mrs. A. M., age 36, recurrence of postpartum malignancy three years afterwards. She is a cure 35 years after the intercostal recurrence was removed.

The second case, Mrs. W. F. H., age 56, was given two years of good health and one year of life after the sternal recurrence was removed. No other metastases were found even during post mortem examination except a trochanteric fracture. She had no recurrence in chest or lungs.

The third case, Mrs. A. H., age 57, was twice declared "not malignant" by a competent pathologist, Dr. Warthin. There was a slow-growing lump for two years which was malignant. Recurrences were respectively twenty-two and ten years; this amount of time having elapsed since the initial operations, suggests the development of a new tumor. This is confirmed by the statement of the pathologist, Dr. H. R. Prentice, who said "size of nodule suggests primary tumor rather than metastasis". The patient has been free from cancer the last four years, and eight years from the first removal, with no signs of recurrence to April 1949, except as above in 1945.

Case four, Mrs. E. T., age 63, developed cancer sometime between August 21, 1933, and July 15, 1942. It was thought that the metastatic mass over the sternum should be removed in spite of the late appearance of the patient and the spinal pathology. Evidently this patient had a fulminating type of cancer which caused one recurrence after another until her death two years later.

Case five, Mrs. M. E. B., age 56, was a Paget's disease and a duct cell carcinoma, knowingly delayed three months because of condition of patient's husband. Radically removed April 19, 1942, at which time the ribs were apparently not involved. Clinically there was recurrence, although careful x-ray studies said there were none. The sternum and parts of three ribs were removed August 20, 1942, and the left breast removed because of rapid development on Sep-

tember 7, 1942, at which time x ray studies of the chest were negative She died of recurrence about 1945, but no particulars were available

The sixth case, Mrs A. W , age 74, looked favorable for a cure, but she died within twenty-four hours with only fifteen minutes of symptoms, probably from embolus

There is a suggestion that inflammation, as in the empyema, may be a factor in non recurrences, and some of these "recurrences" may not be recurrences at all, but rather may be new tumors Sometimes there was x-ray evidence of recurrence in the sternum, but not always

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RESULTS OF EARLY TREATMENT OF CONGENITAL ANOPHTHALMOS

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Congenital anophthalmos is a rare abnormality. In 1900 von Hippel was able to collect only 64 bilateral and 23 unilateral cases in the literature. However, the more recent literature and our own experience indicate a more common occurrence. Also, extreme microphthalmos, which is reported more commonly and can often be distinguished from true anophthalmos only by serial sections of the orbital contents, offers the same practical problems of treatment.

The etiology of congenital anophthalmos may be ascribed to either the endogenous factors of heredity or to exogenous factors such as intra-uterine inflammation or toxemia, with considerable experimental evidence lending weight to the latter. Laplat is reported to have produced anophthalmos or cyclopia in tadpoles by spraying aqueous solutions of toxic substances on frog eggs during certain stages of development. Stockard reported he was able to produce both unilateral and bilateral anophthalmos by breeding alcoholized animals through several generations; he also obtained similar results by treating fish eggs with alcohol during certain stages of development and by treating hen eggs with alcoholic fumes either before or during incubation. Other workers have shown that chicks with undeveloped eyes or no eyes at all could be produced either by exposure of the eggs to X-rays or by injection of toxic substances into the eggs.

According to Mann, heredity of anophthalmos is rare, with no marked sex incidence, and the tendency to bilaterality and the sporadic incidence are in favor of an environmental cause. Rare familial and hereditary cases are obviously germinal and several of these were unilateral.

Mann has classified congenital anophthalmos into three types and summarized the anatomy of the defect as follows:

(1) Primary anophthalmos, in which the single originating fault is failure of the optic pit to deepen and form an outgrowth from the forebrain. It begins at or before the 2 mm. stage.

(2) Secondary anophthalmos which usually occurs only in non-viable monstrosities and is due to complete suppression or gross abnormality of the forebrain.

(3) Degenerative or consecutive anophthalmos includes cases in which the optic outgrowth has developed, then degenerated. Embryos are occasionally seen with one optic cup stunted and not in contact with the surface ectoderm. Such an eye might be expected to lead to either extreme microphthalmos or anophthalmos.

There are usually no other associated defects. The eyelids are present and except for their small size and concave contour, appear normal. The cilia, puncta,

lacrimal gland and meibomian glands are normal The palpebral fissure is short ened and the orbit is small The extra ocular muscles may be present with normal innervation The orbit may contain fat, muscles and nerves but the optic nerve is absent and the optic foramen small Hare reports measurements of the bony orbit by means of X rays and measurements of the soft tissue socket by means of molds in two cases The measurements of both the orbit and socket averaged roughly 30% smaller than normal in all diameters

The problem of treatment is to transform a socket of inadequate size and shape into one that will retain a prosthesis of satisfactory size and contour In some cases the diminution in size of the socket and palpebral fissure may range well beyond 50% and is of course more apparent in unilateral cases If un treated, this disparity is not corrected by growth and in fact appears to increase In traumatic anophthalmos the relative size of the socket may be larger but the loss of lining and lid tissue with scar formation and deformity of the bony orbit may present a problem quite similar to that of congenital anophthalmos The conventional approach to this problem has been to enlarge the socket and palpebral fissure by dissection with the addition of lining in the form of skin or mucous membrane grafts A review of the English and American literature since 1928 reveals that contributions in regard to treatment have been virtually limited to variations in the technique of grafting The amount of lining necessary usually demands skin grafts instead of mucous membrane grafts

While this method can result in considerable increase in size of the socket, there is common agreement that the overall result is far from ideal The skin grafts may produce an offensive discharge and lack the pliability and elasticity of normal lining The scar tissue produced further inhibits the adaptability to a prosthesis When the palpebral fissure must be lengthened the lid edge resulting from the junction of skin and skin graft is devoid of lashes and presents an un natural appearance

A case of congenital unilateral anophthalmos treated in the above manner is shown in accompanying photographs The patient was first seen at the age of 4 years and the bony orbit was so small that it was necessary to carry the dissec tion and grafting anteriorly or superficial to the orbital rim in order to obtain upper and lower cul-de-sacs of any appreciable size The length of the palpebral fissure was overcorrected to facilitate grafting and the excess length is to be closed at a later operation A great increase in the size of the socket was obtained as evidenced by pre operative and post operative photos, and cul-de-sacs of quite adequate size also resulted The graft itself is excellent but the sum total result of treatment is far from satisfying When the length of the palpebral fissure is corrected and the upper lid elevated this patient will be able to retain a prosthesis and will show a fairly representative result of the usual surgical treatment of this condition

An alternative method of treatment is that of progressive dilatation, begun at the earliest possible age Such a method was described in Russian literature by Y Pribylskaya in 1931, he reported good results on a series of 16 patients with eight year follow ups Gougelman in 1937 described and recommended

Fig. IA

Fig. IB
Fig. I

This girl was brought in for treatment at the age of 4 years. The socket was enlarged by dissection and addition of lining in the form of a split-thickness skin graft 9 months ago. The size and shape of the socket are adequate and after further closure of the outer canthus an artificial eye can be fitted. There are no lashes in the lateral two-thirds of the lid margins and the entire orbit is at a lower level than the normal one.

progressive dilatation, particularly in cases of cryptophthalmos and extreme microphthalmos and emphasized the importance of beginning at the earliest possible age, although he also had good results in some adults. In 1939 Lemere reported successful dilatation and fitting of a patient 4 years old with unilateral congenital anophthalmos; his patient had previously been untreated for four years since extensive consultation of the literature and colleagues had brought no suggestion for satisfactory treatment. He emphasized the difficulty in finding information regarding treatment.

Fig 11

H. B. Lemere's case dilatation was begun a artificial eye as shown! munication Dr. Lemere reports it was subsequently increased to a size approximately equal to the normal eye.

Therefore, although the method described here was arrived at and developed independently by one of us (T.K.), no claim to originality is implied but rather we wish to redirect attention and recognition to a method which appears to be the treatment of choice and yet has escaped general knowledge. We are aware that such a method is not in common use among plastic surgeons in this country and inquiry among a number of ophthalmologists indicates a similar situation in the eye field.

In our experience progressive dilatation of the anophthalmic orbit has been used in a series of four patients, with the longest follow-up period being 4 years. To date there has been only one unsatisfactory result; after successful dilatation and fitting of eyes at the age of 18 months this patient failed to return for further examination and treatment for a period of 2½ years. It is hoped that by continued
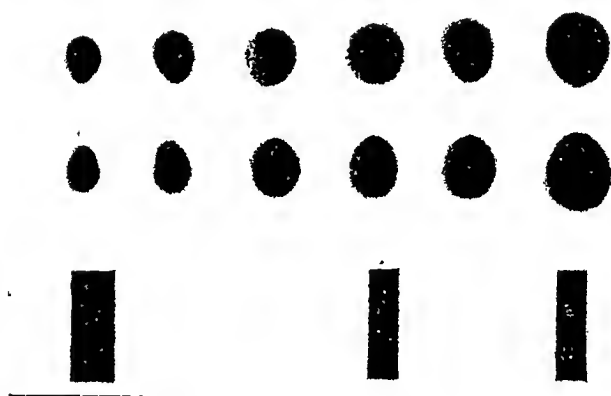
Fig. III J. B.

Illustration of acrylic forms used in the treatment of bilateral anophthalmos from the age of 12 months to 19 months. Satisfactory fitting of artificial eyes followed. Patient lost before photographs could be obtained.
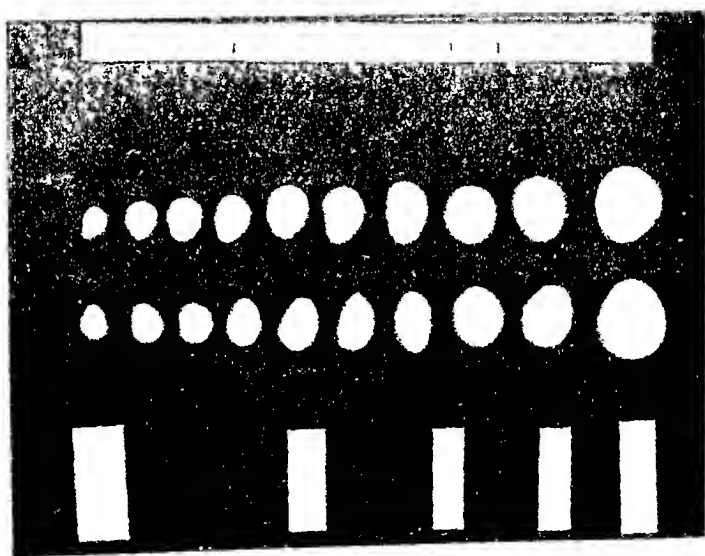
Fig. IV P. D.

Another case of bilateral anophthalmos in which treatment was begun at the age of 10 weeks. Increase in the size of acrylic forms to the age of 18 months is shown. Artificial eyes were then fitted but unfortunately photographs of the patient were not obtained.

dilatation now, the proper relative size of the sockets may be regained. Two other patients have been followed for less than one year but in each case the
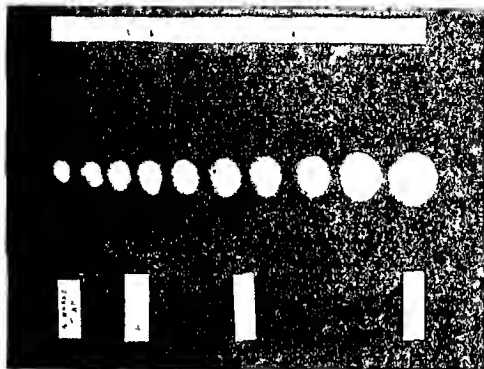
Fig VA

Fig VB

Fig V C G

A Unilateral anophthalmos with treatment by dilation begun at the age of 4 weeks The increase in size of forms up to 13 months is shown
B Result at age of 4 years The artificial eye (right) has been worn for over 3 years with no difficulty The eye has been increased in size at intervals and the patient is fully accustomed to it

socket has already been dilated to several times its original size The fourth patient presented unilateral anophthalmos and treatment was begun at the age of

one month, using a form measuring 6 mm. in length; at the age of 13 months he was wearing an artificial eye measuring 22 mm. in length with a very satisfactory appearance. Thereafter, a slightly larger eye has been inserted every 3 or 4 months and now at the age of 4 years the artificial eye and lids match the normal side completely with no visible deformity. In each case it has been most gratifying to obtain adequate size of the socket together with preservation of normal lining, lid edges and lashes.

The entire treatment in these patients has been developed and carried out by the optician alone (T.K.), and it is believed that the most important requirement for success is the opportunity to begin treatment in early infancy. The forms are not fitted from impressions but instead a wax form of the desired shape is fitted by trial until the maximum size that can be retained is reached. This is then duplicated in acrylic and inserted. Usually within a few days a form nearly twice as large can be fitted. Two or three weeks later a still larger form can be retained and increases in size are possible thereafter at increasing intervals of time. Contrary to popular belief, the fitting and retention of forms in infants can be readily accomplished with sufficient ingenuity on the part of the optician. It is interesting to note that treatment by dilatation was attempted elsewhere at the age of one month in the patient presented in Fig. 1, but was abandoned because of difficulty in keeping a prosthesis in place. Temporary strapping with pads and adhesive over the eye or splinting of the arms may be occasionally necessary to avoid displacement of the form but in this series of patients very little difficulty was encountered once a proper fitting of any form was accomplished.

It is evident that the necessary increase in size of the socket can be most readily accomplished when dilatation is begun during the rapid growth of infancy while the bony and soft tissue is more mobile and adaptable. The popular idea of waiting until the patient is old enough to cooperate does not serve the best interests of the patient. When begun early and carried through properly, dilatation can produce a socket which is entirely adequate for a prosthesis with preservation of normal lining and lid structure. By producing the most natural appearance and avoiding the disadvantages of surgery, this appears to be the treatment of choice.

(Note: Just after completion of this paper an article appeared substantiating our results and showing the improvement possible by dilatation of the infantile socket in the adult. Murphey, Phelps J., D.D.S., Newton, F. H., M.D., Stell, Cecil, M.D. and Hawk, Peggy Parker, B.A. "Esthetic Correction Of Unilateral Anophthalmos By Ophthalmoprosthesis" Archives Of Ophthalmology, Vol. 40 No. 2, Nov. 1948, Page 497.)

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CONGENITAL ABSENCE OF THE PECTORAL MUSCLE AND SYNDACTYLISM: A DEFORMITY ASSOCIATION SOMETIMES OVERLOOKED

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Multiple congenital deformities in a single individual are not uncommon. Congenital absence of the pectoral muscle group has been previously reported and numerous papers have been written about syndactylism; however, the incidence of the association of these two types has not yet been determined. The pectoral muscle defect may be overlooked since it usually causes no especial disability and the frequency of the association, therefore, may have remained undetected.

The recorded pictorially represented cases showing the association of these two deformities are few. Only two had been in the literature until 1939, when Brown (2) recorded the photographs of an infant showing web fingers and absence of the pectoral muscle on the same side. Since that time Resnick (6), in 1942, reported three cases in children.

We wish to describe a case of an 18 year old, white male, showing the associated congenital deformities to which we refer. In this patient the absence of the pectoral muscle (Fig. 1) was manifested by chest flatness, high nipple line, and loss of the axillary fold configuration. Syndactylism was also present. The 2nd phalanx of the index finger involved was absent. The case history records no congenital deformities of either character in any of the known relatives.

Numerous cases of hand anomalies are on record where hereditary continuity now has been definitely established. Willard, Kanavel, Cushing, Drinkwater, Mohr, Bagg and Bunnell have substantiated the Gene theory by actual family cases. Transmission may be atypical, dominant or recessive. From the experiments of Bagg and Cornell the germ plasm of mice has been altered by x-rays to effect abnormal alterations in development. These have become true Mendelian recessives. Experimentally anatomical defects have resulted from diet limitations. In fish, amphibians and birds anomalies have occurred by interrupting the early embryological speed of development. This has been accomplished by instituting low temperatures or by oxygen limitations. Webs have normally occurred in primitive marsupials. We see these formations in the Kangaroo, beaver, and moles. Syndactylism has occurred in the orang-utan, the gorilla, and the chimpanzee. The Siamangs of Sumatra and the Malay Peninsula, referred to by Davis (4) and Straus (7), normally have a web between the 2nd and 3rd toes.

Syndactylism in humans may be classified as congenital or traumatic. In the former it occurs in a multitude of forms. Webs between the digits, fingers or toes, may be long or short extending from the interdigital space, up to and

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including the finger tip. Congenital involvement may also include intrinsic structures The phalangeal bones may show many varieties of pathological alterations, from total absence up to lateral fusions. In the latter, fibrous fusion

a

b   c   d

surface coverage
    (d) X ray shows complete absence of second phalanx, index finger associated with the webbing

from surface loss between the fingers and allied areas may give infinite variety of soft tissue adhesions and contractures

In regard to the pectoral muscle anomaly case reports show that complete absence is rare. Ordinarily the most frequent lesion shown is the absence of
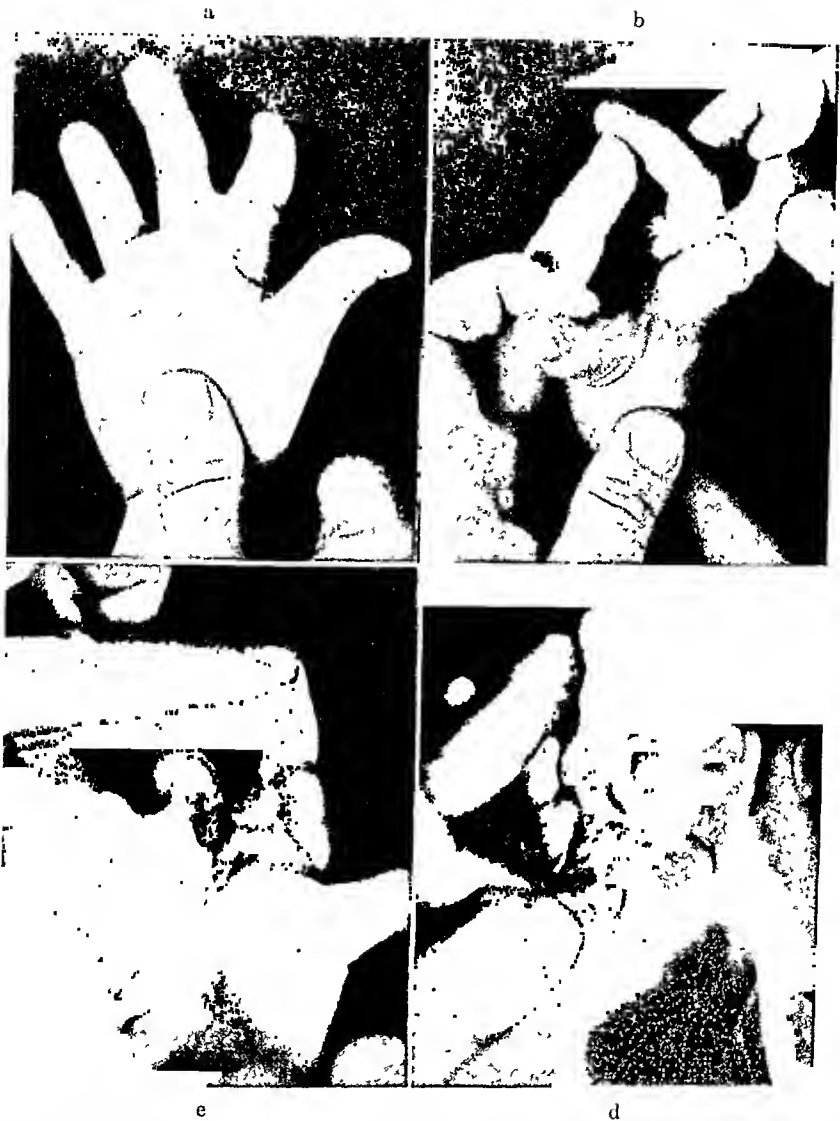
FIG. 2. (a). Pre-operative appearance of hand showing traumatic syndactylism with palm involvement. Pedicle flap from abdomen had been employed at initial surgery elsewhere, two years ago.

(b). Demonstrates small flap (said to have been used because tendons were exposed) and scar flexion contracture of index finger.

(e). Post-operative appearance after adding free skin graft to supply actual surface volume lost, note skin graft darts.

(d). Compare (d) with (b). Demonstrates functional mobilization now present.

the sterno-costal portion. In this case galvanic tests showed a similar finding. Since disability from pectoral absence was negligible this deformity did not influence this patient's active duty.

The treatment of the hand anomaly (Fig. 1) was carried out by utilizing additional skin from elsewhere as a direct transplant to cover the raw denuded area when the fingers were separated. Since previous surgery had apparently destroyed the quality and extent of interphalangeal web skin without obtaining finger separation, this method seemed to be the one of choice. If one sees the

Fig. 3. (a). Pre-operative appearance of severe burn of the hand involving palm with heavy corded cicatrix, producing flexion deformity and fibrous fusion between index finger and thumb.
(b). Post-operative result, one operation. A three-quarters thickness skin graft was used.

case first, however, some form of interdigitating the web skin might be the procedure employed. Webster, Cronin, and others have shown these methods. Combined procedures, depending on the indications, may be utilized. Padgett and Bunnell have felt that the interphalangeal space at the metacarpal junction could best be reconstructed by utilizing web skin as small traingular anterior and posterior flaps which would inter lap reproducing the more normal recessed angle of the interdigital plane. The remainder of the denuded area then is skin grafted. This crotch flap coverage eliminated the "U" shaped contracture with

the resulting anterior and posterior skin shelf that we not infrequently see
from complete grafting from finger tip to base. When syndactylism is of trau-
matic nature and adherence is by fibrous adhesion then skin resurfacing may be
the acceptable method throughout. The free skin graft at the interdigital space
had then best be pointed. Over-correction to some extent will also be advisable.
Ordinarily we do not see burns in the hands of infants with destroyed intrinsic
structures. Physical examination will usually indicate mobility of subjacent
structures. Pedicle flaps would be employed only in the very rare case. The case
of traumatic syndactylism, (Fig. 2) presented had been operated upon two years
previous to the entrance to our hospital. The small abdominal flap was then
applied for coverage. The flexion contracture and interdigital fusion at this time
was relieved by free skin graft alone. Rotated flaps were contra-indicated be-
cause of insufficient hand surface tissues.

It is well always to free the immobilized hand from its scar contractures as
soon as possible. Not only are dorsums involved with their chain of problems
but also palmar surfaces show the loss sometimes of almost the entire normal
palm skin flexing and fusing the fingers as well. For return of function removal
of the corded cicatrix is indicated. In Fig. 3, excision of the binding scar mobilized
the hand into normal extension. Resurfacing was accomplished by free graft.
This transplant gives a much more acceptable result than a pedicle flap. This
latter always hangs as a bag and rarely becomes thin enough by defatting to be
equally satisfactory. If, however, intrinsic palmar reconstruction of special
nature is contemplated then a satisfactory soft tissue bed must of necessity be
supplied.

SUMMARY

A case of associated syndactylism and congenital absence of the pectoralis
major muscle on the same side in a patient 18 years old, has been shown. Free
skin grafting was employed to correct the finger fusion defect. The use of this
transplant in traumatic syndactylism with allied palmar defects has been shown
in relationship.

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FATE OF AUTOGENEOUS RIB CARTILAGE TRANSPLANTED INTO THE NOSE*

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The fate of living and dead cartilage transplanted in humans is not exactly known According to Peer (1) there are different views indicating 1) Cartilage tends to survive when transplanted, 2) cartilage tends to degenerate when transplanted, 3) cartilage survives when transplanted with perichondrium It seems the consensus of opinion that autogenous cartilage is better material for plastic repair than dead cartilage because autogenous rib cartilage survives after transplantation and, up to a period as long as 6 years, neither increases nor decreases in size (Peer) This opinion is based particularly on the experience gained by transplantation of cartilage under the skin of the chest or abdomen Less frequently cartilage was examined which was transplanted beneath the skin of the external nose Peer (2) describes the microscopic examination of a graft with perichondrium on one side which had been inserted in the nose to fill up a deep saddle and was removed 13 years after transplantation by Dr Warren Davis The bulk of the cartilage showed no evidence of invasion or absorption and the cells and matrix appeared normal There was one rather small area at the edge of the graft where fibrous tissue invaded the cartilage Peer interpreted this is a fibrous replacement of a small portion of cartilage injured at the time of transplantation In another case, Straith (quoted after Peer) had transplanted an autogenous costal graft, with the perichondrium removed, beneath the nasal skin Five years after the transplantation the cartilage was entirely normal Iglauer (3) removed autogenous cartilage from the nose four and one half years after the transplantation This specimen showed the matrix intact, but the majority of cells were absent Some large areas showed striking degenerative changes with eroded and crumbled cartilage Iglauer considers this finding as an exception to the general rule

CASE REPORT

E G age 50 years white female She had a marked deformity of the nose which was noticed in her childhood and was probably due to a hypoplasia of the nasal bones and the upper lateral cartilages on both sides She always complained of difficulty of breathing through the nose She never was severely ill and had never been injured In 1925 a nasal plastic was performed A septum resection was made and rib cartilage was inserted at the back of the nose as well as at the columella The result of the operation was satisfactory and remained as such for the next 5 or 6 years Then the cartilage at the back of the nose gradually gave way The cartilage which had been implanted into the columella and at the tip of the nose remained Cartilage has never been expelled

An examination on September 6 1946 a deformity of the nose was noticed (Fig 1 and 2) The columella was broad and firm and there was a scar in the skin of the columella The left nostril was narrower than the right In the area of the left plica vestibuli there was a crescent like fold of skin which originated from the floor of the nose as well as from the

A   B
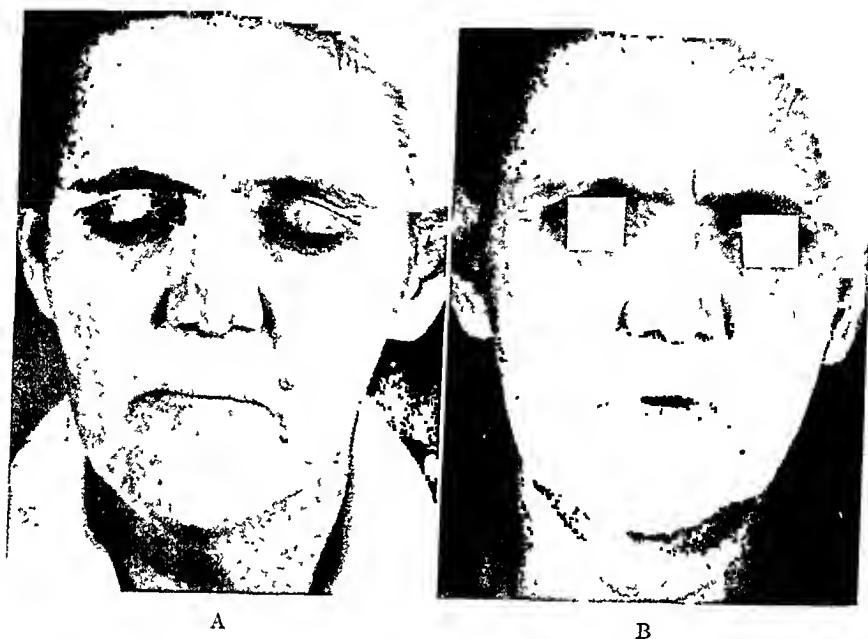
Fig 1 A Before operation, B After operation

Fig. 2. A. Before the operation, B. After operation.

septum and closed almost the entire nostril Behind this membrane a firm mass could be felt.
Choanae were normal. Kahn was negative and the X-ray findings showed normal sinuses.
On September 7, a circular incision was made into the atresia membrane in the vestib-

ulum nasi A skin flap was prepared and turned downward Behind the flap there was a mass consisting of connective tissue and pieces of cartilage A part of the mass was removed and the rest was pressed toward the back of the nose A resection of the posterior part of the septum was suggested but refused by the patient On September 21, 1946 a rhinoplasty was performed An incision was made in the left nostril inferior to the upper lateral cartilage A subcutaneous pocket was prepared for the reception of the bone graft at the dorsum nasi Then the columella was dissected free and an oblong piece of cartilage, about 12mm in length and 3mm in breadth was removed A pocket was prepared from the anterior nasal spine to the tip of the nose for the reception of the bone graft The region of the right iliac crest was cleansed A convex incision was made inferior to the iliac crest for a distance of 3 inches Tissues were separated to expose the iliac crest The gluteal muscle attachments were separated A proper length of cancellous bone graft was taken from the iliac crest to fill the cleft in the dorsum of the nose and that of the columella The bone grafts were implanted at the respective places A button shaped bone graft was placed on the tip of the nose The latter graft had to be replaced at a later period of time by a larger graft of preserved cartilage

MICROSCOPIC EXAMINATION

Cartilage removed from the dorsum nasi There is a small piece of cartilage surrounded by firm connective tissue which at several sites extends into the cartilage The cartilage shows a great number of cells surrounded by slightly basophilic capsules, but halos around the cells are either absent or poorly visible Cartilage removed from the columella (Fig 3) The cartilage is covered on one side by a fine perichondrium which covers a narrow subperichondrial layer of cartilage On the other side of the cartilage there is no perichondrium This is probably the cut surface of the implant (Fig 3) At this side loose connective tissue, poor in cells, replaces the cartilage, digging lacunae into the rest of the cartilage Within the connective tissue several cartilage cells with their capsules are scattered indicating that cartilage cells may persist even in the absence of an intercellular substance

These findings may be caused by one of two pathologic changes 1) The cartilage in this area has become degenerated and liquefied and the defect has been replaced by connective tissue originating in the fibrils of the rest of the cartilage 2) The cartilage, regardless as to whether a degeneration had taken place or not, has been invaded by connective tissue which originated in the tissue surrounding the cartilage The finding of lacunae (Fig 3) toward the normal cartilage and the findings of the dorsum nasi where the cartilage was cut in pieces by the invading connective tissue, indicate the second concept to be correct although it cannot be proved in the specimen The bulk of the cartilage, close to the perichondrium, shows a territorial differentiation viz , there are cartilage cells or isogenous cell groups surrounded by pale and/or dark halos[1] and there is a small amount of a slightly basophilic ground substance between the cell-territories In the center of the cartilagtnous strut the territorial differentiation is absent In this area there are many cataplastic cells, furthermore cells with a capsule but without halos or cells with indistinct halos There is a localized area presenting a calcification of the cells as well as the ground substance

[1] The halos who
tory", are caused
entiation, in turn,
exert an influence upon the structure of the cartilage
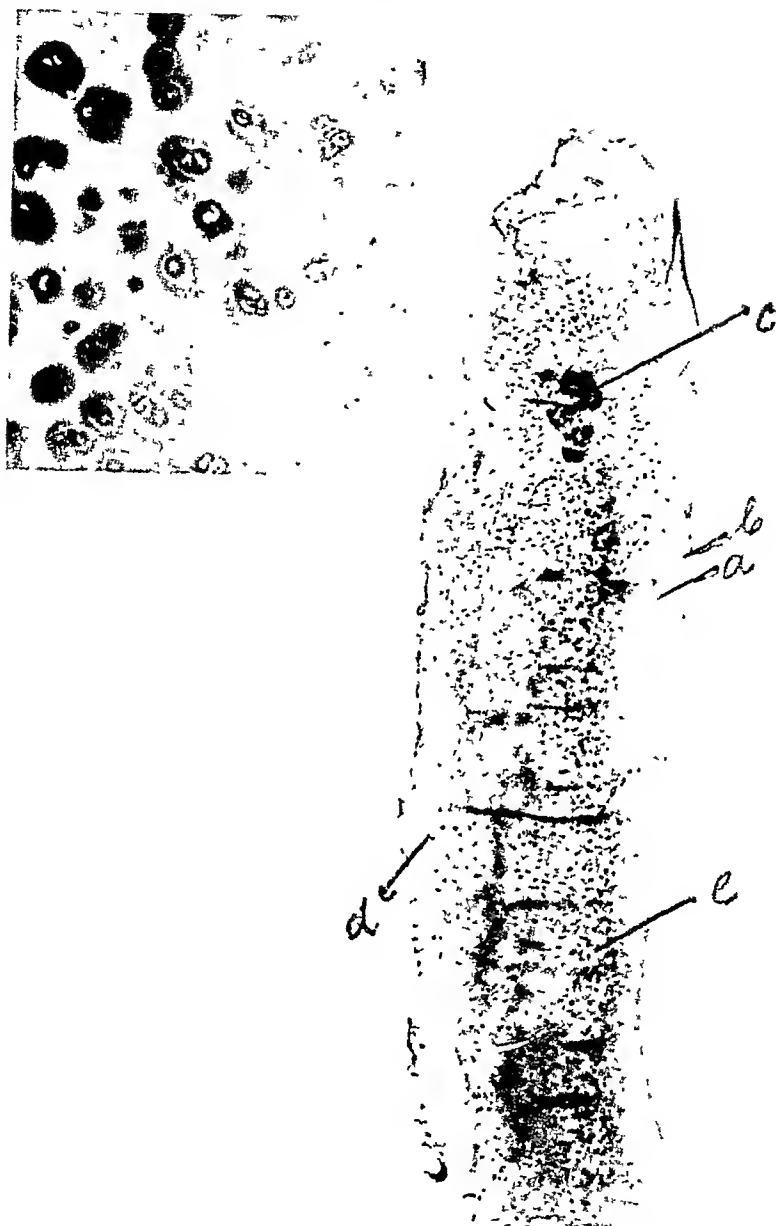
FIG. 3. Living rib cartilage implanted into columella 21 years ago a Subperichondral layer, b. Perichondrium, c. Calcification, d. loose connective tissue invading the cartilage, e. cartilage with formation of cell-territories which are shown in the insert in higher magnification.

COMMENT

I did not have the opportunity to check the patient's record concerning her operation in 1925. Therefore, all comments upon this operation are based upon

the history given by the intelligent patient and on the findings of surgical scars on her chest and her nose. Although living rib cartilage was implanted at the dorsum nasi as well as at the columella, the cartilage at the dorsum nasi gave way while the cartilage at the columella preserved, to a great extent, both the vitality and the specific structure viz., the formation of cell-territories and halos, for 21 years. The cartilage at the dorsum nasi was broken up by the invading connective tissue and both tissues, cartilage plus hyperplastic connective tissue, formed a mass which at the ostium internum of the left nostril bulged the nasal mucosa into the nasal fossa causing an incomplete atresia of this nostril.

It is evident that the fate of the implanted cartilage was entirely different at the dorsum nasi on one hand and the columella on the other hand. It is difficult to explain this finding. Hypothetically the opinion could be advanced that the tissue surrounding the implants may determine the fate of the implanted cartilage. At the dorsum nasi the implant is pressed toward the nasal bones by the overlying skin viz., it is exposed to a continual and abnormal pressure, at the columella mechanical forces exerting influence upon the implant, are almost absent. Mannheim and Zypkin (4) point out that the vitality of cartilage is better preserved if it is implanted into soft tissue than after implantation into a defect of the skull. Although these experiments do not exactly answer the question, they indicate that the vitality of the transplanted cartilage may depend on the place of implantation.

So far as the resorption of the implanted cartilage is concerned it is evident that in the presented case degenerative changes of the cartilage are of minor importance as compared with the invasion of cartilage by connective tissue, originating in the surrounding tissue. In general, it is not an easy task to determine findings of degenerative changes in hyaline cartilage is strictly pathological because cataplastic cells, calcification and asbestos degeneration occur frequently under normal conditions. In the presented case, the cartilage implanted into the columella did not show any degenerative changes except a small area of calcification, a finding which cannot be classified as pathological.

If connective tissue invades the cartilage the ground substance is resorbed more rapidly than the cells. For this reason cartilage cells were found within the hyperplastic connective tissue at the dorsum nasi and in the area of resorption within the cartilage implanted into the columella (Fig. 3).

To sum up, the presented case indicates that the fate of the transplanted living rib cartilage is not determined by the tendency toward degeneration, but by the resistance of the cartilage against the surrounding connective tissue. In this respect the specimen proved that living hyaline cartilage covered by perichondrium offers a greater resistance against invasion of connective tissue than cartilage which is not covered by perichondrium.

It should be noticed that the columella cartilage has preserved the specific structure viz. the formation of cell territories and halos, yet it was no longer exposed to the mechanical forces resulting from the movements of the ribs. This indicates that the specific structure of rib cartilage is quite stable and persists regardless as to whether or not it is subject to the physiological mechanical forces.

CONCLUSION

1.) In a case in which living rib cartilage was implanted into the back of the nose as well as into the columella, after an elapse of 21 years the cartilage at the dorsum nasi was broken up and the cartilage in the columella has preserved its gross appearance.

2.) This finding may be hypothetically explained by the influence which the surrounding tissue exerts upon the implant.

3.) In the presented case degenerative changes of the cartilage were of minor importance as compared with the invasion of cartilage by connective tissue originating in the surrounding tissue.

4.) If connective tissue invades the cartilage the ground substance is resorbed more rapidly than the cells.

5.) The fate of the transplanted living rib cartilage is not determined by the tendency toward degeneration but by the resistance of the cartilage against the surrounding connective tissue. Cartilage covered with perichondrium is more resistant than cartilage without perichondrium.

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BENIGN HYPERPLASIA OF THE MANDIBULAR CONDYLE

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Bony and cartilaginous enlargements confined to the condyloid process of the
mandible are relatively rare and cause a slowly progressive vertical elongation
of one side of the face, the chin being deviated toward the opposite side. There
is a "cross bite" occlusion of the teeth, the lower teeth being pushed over to
the opposite side. There is practically no interference with the motion of the lower
jaw. There may be some pain on motion in the region of one or both condyles as
the case progresses. The enlarged condyle may be palpated and will be revealed
by X ray examination. Most authors are now agreed that the treatment indicated
is resection of the enlarged condyle, which procedure is usually immediately
followed by restoration of the occlusion of the teeth and symmetry of the face.

Although previously described by others, Eckert (1) in 1899 is believed to
have been the first to resect the enlarged mandibular condyle for the condition.
Eckert's case has been mentioned by several other writers, notably Perthes (2)
in 1907 and Scudder (3) in 1912. In 1926 Gruca and Meisels (4) collected 19 cases,
including three of their own. In 1931 the writer (5) reported two cases in which
he resected the condyle. Later, in 1938, Kanthak and Harkins (6) reviewed the
literature and reported a case. In 1946 Worman, Waldron and Radusch (7)
described a case in which they removed the enlarged condyle. Brown, Paterson,
Cannon and Moore (8), and McNichol and Roger (9) in 1946 each present a case
of asymmetry of the mandible due to this cause. The latest cases of unilateral
hyperplasia of the mandibular condyle to be reported are those of Wang Norderud
and Lossius of Oslo in 1948 (10). In their three cases the resected enlarged con-
dyle showed a proliferation of hyaline cartilage in different places.

A recent case is now reported, in which a method of resection is described
which is believed to be simpler and more time saving than the procedures em-
ployed by most surgeons, and furthermore permits removal of the condyle
without mutilation of the specimen.

The patient was a female, aged 38, who when first seen in January 1945
presented the typical syndrome due to hyperplasia of the left mandibular condyle,
which had been slowly progressing over a period of several years. She had no
other complaints and physical examination revealed nothing abnormal else-
where. The left side of the face was elongated, with the chin deviated to the right
(Fig. 1). A hard prominence could be felt over the left condylar region. The move-
ments of the lower jaw were unrestricted, but she had slight pain in both joints

on movement. The "cross-bite" occlusion of the teeth is seen in Fig. 2. The lower anterior teeth extended toward the right about the width of two incisor teeth, with protrusion of these teeth. X-ray examination showed marked enlargement and irregularity of the left mandibular condyle (Fig. 3). Fig. 4 shows plaster

Fig. 1. Lengthening of left side of face with deviation of chin to right.

Fig. 2. "Cross-bite" malocclusion of teeth, lower teeth being pushed over toward the right.

casts of the teeth in the occlusion presented by the patient. It was possible by manipulation of the casts to restore the occlusion to about normal, as shown in Fig. 5. In view of the favorable restoration of occlusion on the casts, it was decided to resect the enlarged left condyle. This operation was done on January 3, 1946, at the Presbyterian Hospital under endotracheal anesthesia. A skin incision

two inches long was made beneath and behind the left angle of the mandible and part of the masseter muscle reflected from the outer surface of the ascending

FIG 3 Radiograph showing marked enlargement of the left mandibular condyle
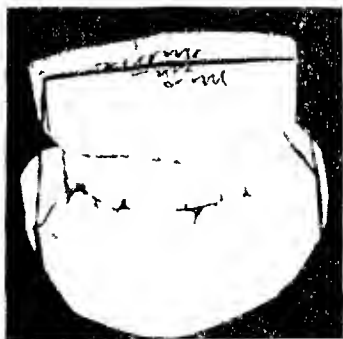
FIG 4 Casts of upper and lower teeth showing malocclusion Median line between mandibular first incisors is considerably to right of that between maxillary first incisors

ramus, as suggested by Risdon This permitted easy access to the region of the neck of the condyle A Blair curved pedicle needle was passed in the depths of the

Fig. 5 Casts of upper and lower teeth in corrected position showing possibility of restoring good occlusion by operation.

Fig. 6. Showing position of pedicle needle around neck of condyle, point emerging just below zygomatic arch.

wound behind the neck of the condyle keeping close to the bone and its point made to emerge through the sigmoid notch just beneath the zygomatic arch

1 to 7 Outer and inner views of left condyle removed at operation showing general bony and cartilignous hyperplasia

(Fig. 6) where it was exposed by a small stab incision through the skin. A wire was threaded through the eye of the pedicle needle and by this means a Gigli

FIG. 8. Front view postoperatively showing restoration of chin to median line.

FIG 9 Postoperative restoration of almost normal occlusion

saw was carried around the neck of the condyle, the ends of the saw emerging through the two incisions. The neck of the condyle was quickly and cleanly

divided by the saw, and after dissecting free the soft tissue attachments, especially the external pterygoid muscle, the bony mass was easily removed intact. The

Fig 10 Mouth opening ten days after operation

Fig 11 Left profile after operation, showing small operative scar around angle of mandible

specimen shown in Fig 7, a and b, revealed a greatly enlarged condyle with cartilaginous as well as bony proliferation Oxidized gauze packing was used in

the depth of the wound to control oozing. The wound was closed with deep catgut sutures and silk for the skin, without drainage. The actual operation required twenty minutes. It was followed by uneventful healing and immediate restoration of the symmetry of the face and occlusion of the teeth (Figs. 8 and 9). The opening of the mouth was practically normal after ten days following the operation (Fig. 10). Fig. 11 shows a practically invisible operative scar. Fig. 12 shows a postoperative radiograph.

I believe that this method of approach, first suggested by Risdon (11) for ankylosis cases gives more easy and rapid access to the condylar region than the conventional preauricular approach, with less danger of 7th nerve complications,

FIG. 12. Postoperative radiograph, showing absence of condyle on left side.

and the section through the neck of the condyle with the Gigli saw in the manner described affords a rapid, clean-cut method which is simpler and less time-consuming than the usual chisel and hammer technique, also resulting in less mutilation of the pathological specimen.

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PLASTIC SURGERY PHYSIOGNOMY AND PSYCHOANALYSIS

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Human thinking and progress are largely governed and influenced by technique Progress towards and for the sake of technique has undoubtedly helped the development of culture and civilization, yet, indiscutably, it worked injurious influences upon them New problems and new solutions have made their appearance Things we did not dare to think before have become real The boundaries of knowledge and learning have expanded so much that the amount of scientific data compelled us to specialization The world is moving towards specialization That means that in our special branch of science so much special education is necessary, that certain other branches of science, certain conceptions and problems standing apparently remote have to be left outside our sphere of attention The technical solutions rivet our entire attention and so there is no time left for other observations

Medical science has been progressing at a gigantic pace Technique, which, at first, was subordinate, has now almost completely dominated medical science and especially surgery, and for technique's sake, we sacrifice observation of the biologic and psychic life of the patient Plastic surgery, which, in its present form, is also the result of technical development, is about to lose its way in a blind alley Lots of books, articles, lectures, reviews are published, which contain, almost without exception, either technical innovations, or facts stated long ago, now dressed in a new outward apparel Every author praises his own technical skill in his works Such and similar matters enrich, up to boredom, the amount of casuistic literature Who is interested in my describing the operation on a young man's broken nose which I undertook successfully by implanting a piece of rib in the defect? Or who would be interested in my having "splendidly" corrected the scar of a harelip, badly healed after an operation? It would be utter wantonness to emphasize how I transformed a young lady in to a "beauty" after having operated on her long, hanging, crooked nose, or in how "masterly" a fashion I sewed down the outstanding ears of a little girl We would never progress in our science by such casuistic accumulation, and we would never be able to prove its right to life and its necessity

The importance and meaning of plastic surgery is not to be found in the "magnificence" of the technical solution It is not only the deformed portion of the body we change, but at the same time we alter the human face, we change the humor, the state of mind too When I corrected the defect of the aforesaid broken nosed young man with a piece of rib, then the man who, till then, struggled with restrictions, who was unable to get employment on account of his criminal-appearing features, has succeeded in attaining his normal position, not only socially, but also physiognomically Likewise, we succeeded in rehabilitating a young man with a congenital defect who, in spite of his wonderful musical

talent, used to avoid all society and had become positively melancholic. By correcting his misoperated scar in such manner that after letting his moustache grow, his defect became nearly invisible, his mind became apparently normal. I can only say "apparently", because, to judge by his behavior, his countenance, his contact with mankind, he has been delivered from his old restrictions; but this deliverance was not attested either by a psychiatrist or a psychoanalyst, as the young man did not come under the examination of any such experts. The lady with the crooked and long nose—although several components of her face had been lovely rather than plain—neglected herself, thus increasing her so-called ugliness; whereas the operation which returned her nose to normal rendered the patient conscious of her having become normal and this was intensified by added cosmetics. For the little child with the outstanding ears, going to school had been a continuous torture because of the constant teasing of her school-fellows. And had we not corrected her defect in due time, perhaps it would have developed into a mental defect marring her whole life, which would have proved extremely difficult to heal.

It will be clear from these few examples how many problems emerge and await their solution in plastic surgery. Consequently, plastic surgery is not only a question of technical methods, as some would imagine, but it also reflects light on such matters the examination whereof would clear a great many problems.

First of all there is *physiognomy*, the science of the features. Today, we attach much less importance to physignomy than we did in the 16th, 17th, 18th or 19th centuries. Today we prefer to register the changes of the soul by technical methods, valuing the study of facial expressions hardly more than such things as astrology. Psychoanalysis is already generally accepted as an acknowledged science, though it still has more sceptics than supporters. The number of those who are sceptical toward physiognomy is far greater, although here the visible, the palpable is easier to recognize than in the analysis of the mind. The face and its expressions can and must be analysed in just the same way as the psycho-analyst does with the mind. Even an analyst cannot advance any opinion after first examination, yet the public and a great number of physicians expect to form an opinion at the first sight of the face. Many of them hit the truth instinctively, but this guesswork is a far cry from science. The study of the face must be approached scientifically. The greatest difficulty is that society of the past used to apply so much conventional and civilized varnish on the face, that it is a very complicated task to rub it off. But, just as psychotechnics can nowadays solve certain questions, we can also approach the physiognomic examination by experiment.

Reconstructive surgery is meant to restore the defects arising from injuries. There are qualitative differences between defects arising from injuries. There are qualitative differences between defects arising from inborn abnormalities and esthetic faults—which in reality are nothing else but rare variations of normal anatomical shapes. These may cause practically the same morbid changes of mood as defects following an injury. In these days the number of serious facial

injuries has increased together with the development of war technique; industrial injuries have also become common. Thus, these can also be considered as almost anatomical variations from the psychological point of view. Among the inborn abnormalities of the face, the most common is the harelip which, by its frequent incidence, may cause more or less similar psychic disorders as those stated above. It is natural that the superficial observer believes he finds important differences in different cases, but it will be easy for the analyst to state the analogies. From the point of view of the analyst and the psychiatrist, an esthetic defect may result in the same changes as a defect arising from an injury. The disorder of the mind is reflected in the face, whereas it is always much harder to define a defect arising from an injury, which will largely depend on the extent of the wound. It is evidently comparatively easy for a good observer to perceive the mental disorder reflected in the face.

The task of plastic surgery is the removal of the defect and the restoration of the average-normal form. Having somehow succeeded we shall arouse in our patient the consciousness of his becoming normal, and this again comes to be reflected in his face. We can only then say that the operation was successful if the patient also feels this way and shows it in his face and in his physiognomy. All clinical physicians will confirm the fact that there are patients who refuse to be healed and get cured in spite of their pathological defect being trivial. On the other hand, there are grave maladies where the patient's will power is a great aid to the doctor's healing activity. The relation between the doctor and the patient is not limited to the technique of therapy alone. The curative treatment of the physician does not consist of overcoming the illness alone or of preventing it, but also suggesting to the patient the wish to be healed. This is how one of the problems touching the physiognomy in plastic surgery has to be handled.

Plastic surgery for an injured face is not, of course, so well adapted to physiognomic tests as in the case of esthetic defects, because in the former case the nature of the injury will decide the plastic result, whereas in the latter the possibility of a comparison before and after the operation is afforded and the artificial changes in the face can be registered accurately. It is certain that the result will be decisive only if psychologist or psychiatrist is able to confirm it. This is where plastic surgery and psychoanalysis will meet.

The physiognomy offers yet another possibility for experimentation, viz., combined with anthropology and ethnology, which till now has been made but scant use of. Both sciences might be examined from the points of view of psychology and plastic surgery. We have to start with the fact that primitive and fundamental instincts are everywhere alike. This statement can be easily proved.

The muscular system of all species, of every human being, has the same rôle. This is true of the facial muscles. As the use of arm or leg muscles is everywhere the same, likewise we may assume that the muscular system of the face has also the same purpose universally. Primary changes of mood: sadness, delight, surprise, astonishment, etc., are analogous in every physiognomy. This thesis is always evident in books of travels by ethnologists, in which, however, the

importance of physiognomy is not emphasized. Whenever the ethnologist refers to an intellectual contact with various people, he finds that, although they cannot speak each other's language, by means of facial mimicry they are able to understand one another. The most primitive people, mentally and socially, are perhaps the dwarf negroes, the pygmies, who give proof of their amazing capacity for physiognomic expression. Pater Gusinde, in his excellent book about the pygmies, gives a circumstantial account of this. Others, too, have expressed a similar opinion. Darwin had, also, rendered a detailed casuistical account of it in his great work about facial expression, though not even Darwin recognized the psychologic importance of physiognomy.

Examination of various persons' reactions as reflected in their faces will afford great possibilities for experiment in the sciences of physiognomy and psychology. We may presume that various people attribute great importance to physiognomy. It is not by chance that among every race and people we are likely to find some type of artificial change of the face, be it deformation of the cranium, or tattooing, or the artificial making of scars, or perforation and ornamentation of the ears, nose or lips, or the plastic alteration of the deformed and transformed nose or the sewing back of wide-standing ears, or the removal of facial wrinkles, and so forth. The fundamental psychological idea is similar in each case of artificial facial change. If we will question our patients, or if we let them speak, or wait until they have explained why they wish the esthetic operation then we may find, beginning with superstition up to the most primitive sexual-natural impulse, all those motives which we expect to find among the primitive peoples.

Our explanation for actions of primitive tribes is mostly based on hypotheses. It is a fact that their actions and the reason for their ideas cannot be known to us, because it is quite certain that many centuries and generations were responsible for the development of their present mental attitudes. Thus, the original causes of the various customs have already entirely faded. Any explanation, be it given from a cultural, ethnological, or psychological standpoint, will be no more than hypothesis, which may be just as well true as its opposite. An opinion by a social historial-ethnologist might be directly opposed to that of a psychoanalyst. Both may be right, or neither of the two. It must, therefore, be clear to us that we are merely fumbling in the dark.

Up to now, we have always drawn our conclusions about primitive people and their mental attitude, starting from ourselves; we cut them after our own patterns. We have been heaping up one hypothesis upon another. Let us now try to approach the question from another direction. Primordial instincts are analogous or equal here and there. Let us suppose that the basic reasons for our actions disappeared equally in the dark past, as in the case of the primitives. For these latter, we have set up hypotheses which can be confirmed by our cultured and civilized peoples with the help of analysis; then again we may pass back our conclusions upon them, upon the actions observed amongst the primitives. Plastic surgery will provide suitable material for experiments, in the manner explained above. There are various motives inducing peoples and races to change

their faces We shall not look for a uniform or consistent motive, because a great many causes play a part in it Let us look for these motives in our patients and if we find them, that is, if we find that our suppositions based on the primitives are confirmed by our patients, in that case let us carry back our conclusions to the primitives, according to the axiom of resemblance In this way, with the help of psychology, plastic surgery can be used to solve ethnological questions and can be made use of as experimental material

The first essential for this would be, of course, that we quit looking for technical problems in plastic surgery, but rather examine and observe our "patients" Our technique is already so well developed that we can be quite satisfied with it for the time being On the other hand, we ought to make use of the technical achievements in order to accomplish our examinations in the fields of psychology and biology. For if we don't, we shall be wasting our valuable time and energy on worthless technical modifications, whereas such things which will be irreplaceable in later times—a huge amount of material for examination—will be lost It would now be invaluable to us, if we knew the psycho-physiognomical changes that have gradually arisen in the course of the technical development of plastic surgery In the last fifty years our culture, our social organization, our mental attitude, our environment have changed considerably, that is, everything that influences our psyché as well as our physiognomy There is no doubt that our faces must have changed a lot under these various influences, external and internal Our reacting capacity has changed too All these changes we have neglected to register Had we concentrated our attention during the last fifty years, in the field of plastic surgery, not only upon the technique, but—keeping pace with development of psycho analysis—we had regarded our patients as something more than mere subjects for new technical solutions, but rather as experimental material for the most complicated psychical phenomena, then plastic surgery would be much more advanced today, and perhaps, some important physiognomic, ethnologic and psychologic problems would be already solved

FAT GRAFTS TO THE FACE*

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Of the various body tissues fat is the most difficult to transplant successfully and even when so transplanted there is still uncertainty as to the degree of its absorption. Fat is soft, easily injured, and of poor tensile strength. It is not well nourished and has a low resistance to bacterial attack. It also requires perfect hemostasis and a well nourished protective covering. It needs to be procured delicately and be placed accurately and in excess to allow for an unknown amount of absorption. Despite its many shortcomings it has some real usage.

Fat serves as a resilent pad between the skin and underlying firm tissues. Its absence often causes discomfort due to the direct application of pressure on skin against a bony surface and in exposed areas loss of fat results in a serious cosmetic defect. Loss of fat can occur as a result of infection or trauma and in addition there are mysterious fat disturbances sometimes thought to be congenital, as the hemiatrophies, or acquired as the lipodystrophies. Our very names for these conditions show our ignorance of their causes.

Sometimes depression due to loss of fat can be made up by transplantation of fascia, bone, or cartilage, but frequently abnormal hardness and immobility result. In my opinion there are places, as in the cheek, where fat grafts are the only satisfactory substitutes for lost fat. It is not always desirable to use an inferior substitute just because it is easier to obtain, or more certain to take.

Usually solid grafts retain their original bulk, but with fat there is always some shrinkage, variously estimated at from 25 to 50%. The slow resolution of an excessive graft creates an awkard problem for the patient and a period of extreme uncertainty for the surgeon. Occasionally it can be gauged just right. The tendency is to put in too much on the theory that it is easier to remove an excess than to insert more graft. In the cases presented the aim has been for about a 50% excess.

Case #1. V. G. #840397.

This patient was first examined November 28, 1941. She was 27 years old, single and unemployed. When sixteen years of age she first noted depression of the right cheek. This increased for a few months and has remained stationary since (fig. 1).

Her general health has always been good. She has had no accidents and no inflammation of the face. Her parents and 8 brothers are alive and well. Examination showed a well nourished, normal, young white woman with an obvious depression extending from the region of the right outer canthus of the eye downward across the cheek to the lower margin of the mandible. The skin appeared normal and sensory and muscular actions were normal. The cheek was less than one-half the thickness of the opposite. Free fat graft was advised. After some deliberation the patient returned five years later for operation, August 27, 1946. There had been no change in the depression although the patient had gained considerable weight.

Fig 1 Front view showing loss of fat in cheek

Fig 2 Appearance 18 months after fat graft

A 7 cm incision was made anterior to the right ear and the face skin undermined as far as the canthus of the eye and the commissure of the mouth Vessels and nerves lay between muscles and skin without protection of fat A layer of fat and fascia was removed

Fig. 3. Scar anterior to ear

Fig. 4. Childhood photograph of patient prior to onset of atrophy

from the right lower quadrant of the abdomen and inserted in the pocket of the cheek. Accurate placement was assured by placing several nylon sutures through the skin about the periphery of the pocket. Each of these took a bite in the fascia of the graft which lay next to the skin. Each suture was pulled taut and tied over a square of rubber. The skin

Fig. 5. Loss of fat from right side of face. Note thick short lips

Fig. 6. Note prominence of zygomatic arch and recession of eye

wounds were closed and a pressure dressing applied for seven days, at which time all sutures were removed and the patient discharged two days later

FIG 7

FIG 8

FIGS. 7 AND 8. Appearance following fat graft to right temple and cheek

Marked ecchymosis was noted in the cheek, abdomen and left arm at a hypodermic injection site. These faded in a normal manner leaving an indurated swelling in the cheek.

FIG 9
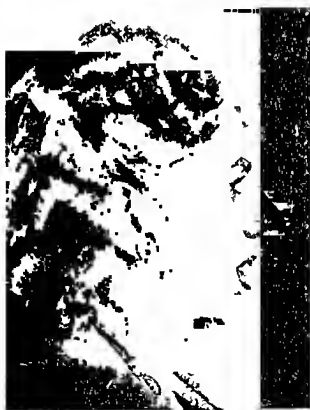
FIG 10

FIGS 9 AND 10 Graft over mandible and into neck

This excess fullness subsided to a normal contour on August 5, 1947, about one year and has remained stationary since (fig 2 and fig 3)

FIG. 11

FIG 12

FIGS 11 AND 12. Graft over temple and chin

Case #2 R. B. #826258

This woman was a 31 year old white bookkeeper who had been normal until she was 5 years old when her family first noted that the right side of her face was becoming smaller

Fig 13

Fig 14

Fig. 13 and 14 Right side of upper lip advanced downward and to left

As she grew the skin became brownish in color and the zygomatic arch, malar prominence and mandible lacked normal fat padding The right side of the lips were thinner and retracted and the eye became more recessed At no time was there fever, inflammation or illness. The deformity remained stationary after the patient reached full growth

FIG 15

FIG. 16

FIGS. 15 AND 16 Depression on right cheek following traumatic loss of fat

Examination showed a remarkably thin, lightly pigmented skin lacking subcutaneous fat from the ear to the nose, lips and chin, and from the temple to the thyroid cartilage There was absence of frontalis muscle action and the right lid action was weak There were no sensory changes (figs 4, 5 and 6)

Fig 17

Fig 18

FIG 17 AND 18 Contour of cheek eleven years after fat graft

On April 20, 1946 a fat graft 6 x 12 x 2 cm was removed from the right lower quadrant of the abdomen and inserted in a pocket made through a vertical incision anterior to the right ear The undermining extended to the outer canthus of the eye and commissure of the mouth The wounds healed well Sutures were removed on the 6th day and the patient

discharged from the hospital on the 9th day. Eyelid action was absent. On May 26, 1946 lid action returned. The cheek was swollen and indurated. By September (5 months) the malar prominence was about normal, but there was too much absorption in the temple (figs. 7 and 8).

A second graft was performed December 12, 1946. The previous scar was extended downward just below the mandible to the point of the chin and the skin undermined upward and downward half way to the clavicle. A large graft of fat and fascia from the left lower quadrant was placed in the wound and held spread out by dermalon sutures about the periphery. There was no febrile reaction. Sutures were removed on the 8th day and the patient allowed home. The graft remained indurated for 5 months. Texture and color of the skin improved greatly (figs. 9 and 10).

On November 13, 1947 fat from the right lower quadrant of the abdomen was inserted into the temple and chin through the upper and lower parts of the original scar line. Sutures were removed on the 7th day and the patient discharged. Postoperative induration was more prolonged than usual subsiding by June 10, 1948, seven months (figs. 11 and 12).

The right side of the upper lip was about half as thick and half as long as the left. The dividing line corresponded to the right side of the philtrum. On July 1, 1948 an incision was made in this line with an extension around the right ala so that the lip could be advanced medially and downward. At each succeeding operation it was possible to inspect the previous fat grafts and each time they appeared normal. No abnormal scarring was seen. The wounds healed well and the sutures were removed on the 5th day allowing the patient to return home. At the last examination, October 2, 1948 all grafted areas appeared satisfactory, but the lip scar was depressed (figs. 13 and 14).

Case #3. D. C. #497977.

This patient was first seen in September 1936. He had scarring and depression of the right cheek following destruction of the tissue due to a gunshot wound 5 years previously. The right eye had been damaged and the infraorbital ridge, malar prominence and zygomatic arch has been lost (figs. 15 and 16).

In November 1936, the infraorbital ridge, malar prominence and zygomatic arch were replaced by a long curving cartilage graft from the rib. Below the cartilage graft there remained a considerable depression into which was placed a fat graft from the abdomen on April 2, 1937. The wounds healed primarily. The sutures were removed on the 6th day and the patient discharged from the hospital on the 9th day.

Subsequently a pedicle graft was placed on the right ear to replace the lost helix. The external strabismus of the right eye was corrected by Doctor John Wheeler and the lower lid partially elevated at the same time. The fat graft has remained soft and in satisfactory condition to the present time. Last examination June 21, 1948 showed good cheek contour and a soft fat pad (figs. 17 and 18).

RECONSTRUCTION OF THE PENIS WITH SPLIT-THICKNESS SKIN GRAFT

A Case of Gangrene Following Circumcision for Acute Balanitis

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Although circumcision is one of the oldest and most common surgical procedures performed, there seems to be a paucity of information concerning complications following this operation Recordings of circumcision as a ceremonial or religious rite are found among the histories of the Hebrew people as far back as 4,000 years ago, and in Egyptian writings during the period of the sixth dynasty (1). The Africans and the early American Indians also adhered to this custom (2)

After a thorough review of the literature we were able to find only two other cases similar to the one herein reported, in which gangrene of the penis was associated with pre circumcisional acute balanitis (3, 4) Two additional case reports of gangrene of the penis following circumcision were also found, however, the indications for surgery were not revealed (5) Of these four cases described, three were treated by skin grafting procedures and one was permitted to epithelize The skin grafting procedures proved successful, but the epithelization produced scarring and distortion after healing

The authors feel that this case is worthy of a report for the following two reasons: (1) it stresses the importance of a serious complication which may result from a simple circumcision, and (2) the details of a technic for successful reconstruction of the penis with a split-thickness skin graft are described

CASE REPORT

A well developed, well nourished 32 year old white male was admitted to the hospital on March 11, 1948, for a circumcision as therapy for an acute fulminating balanitis A genito urinary specialist of good repute performed the circumcision in a hospital operating room under local anesthesia, the patient was allowed to go home immediately following the operation

On March 24 1948 we saw this patient at his home He had been practically bed ridden for the 13 days following the circumcision The patient complained of pain in the penis thighs and back, extreme difficulty in walking, and almost unbearable discomfort associated with urination His physician has advised warm wet soaks to the penis However the patient noticed that pus was leaking out between the stitches, and that the skin seemed to be "rotting." A few days later a bulging appeared over the base of the penis and over the symphysis, the symphysial region became fluctuant and pus also broke through at this point This condition had progressed to such a degree that when we saw the patient the entire shaft was bared, and revealed patchy necrosis throughout the entire corpus of the penis, which was bathed in pus The glans was extremely edematous and also revealed multiple small ulcers The infection burrowed under the skin over the symphysis and

under the anterior abdominal wall, causing a large abscess cavity which lifted the skin from these regions. The superior part of the scrotum also revealed multiple ulcers bathed in a greenish-yellowish pus (fig. 1).

At physical examination an extensive fulminating, ulcerating, gangrenous infection which extended into the region of the suspensory ligament of the penis and under the anterior abdominal wall was seen. Posteriorly it extended to the superior portion of the scrotum where multiple, small, ulcerating areas of the glans were noted. The edges of the wounds were irregular and deep, the discharge was greenish-yellow, and the penis was exceedingly tender to touch.

The patient was re-admitted to the hospital, placed on immediate chemotherapy which consisted of penicillin in oil, 300,000 units twice a day intramuscularly, sulfadiazine, 15 grs. every four hours orally, and warm compresses locally. Opiates were required to relieve the patient from the extreme excruciating pain. He was kept on a high calorie, high pro-

FIG. 1. (left) The Condition of the Penis Two Weeks After Circumcision for Acute Balanitis.

FIG. 2 (right) The Same Patient Three Months Following Plastic Reconstruction with Split-Thickness Skin Graft.

tein, and high Vitamin C diet. After 21 days under this regime no purulent exudate was present, and the necrotic areas were replaced by a clean type of granulation tissue. At this time conditions seemed favorable for a plastic procedure.

Treatment: The decision in favor of skin grafting rather than healing by epithelization was made because we felt that the size of the area involved was too large to epithelize completely.

The operation was performed under sodium pentathol, nitrous oxide, oxygen anesthesia. The operative area was prepared with green soap, ether and merthiolate. A Foley retention catheter was inserted into the bladder to facilitate traction on the penis thus allowing the graft to remain under tension and pressure, to prevent the outside dressing from constricting the urethra and thus interfere with urination, and to keep the dressings free from urinary contamination. Areas of the recipient site that were covered with exuberant granulation tissue on the shaft of the penis along with the overhanging edges of tissue from the anterior abdominal wall and scrotum, were dissected away to allow the graft firm contact with clean, healthy tissue. The resulting oozing that occurred was controlled with thrombin solution and simple pressure for five minutes.

The donor site selected was the right hypogastric region since this was the least hairy portion of the body with adequate skin surface A split thickness graft of .018 of an inch was taken from the donor site with the aid of the Padgett Hood dermatome The graft was large enough to make a single sheath which was placed about the barren shaft of the penis One end of the graft was sutured to the skin of the anterior abdominal wall and scrotum, six of these sutures were kept long at 12, 2, 4, 6, 8, and 10 o'clock thus covering the base of the penis The opposite end of the graft was sutured to the skin surrounding the corona and to the glans proper This was accomplished by allowing six sutures to remain long in the same positions as those at the opposite end of the graft On the under surface of the shaft the graft was overlapped and sewn to itself with interrupted cotton sutures (No 100) Vaseline gauze was placed over the skin graft with mechanic s waste super imposed At each end of the graft the strand of sutures which had been allowed to remain long were tied over the mechanic s waste, this aided in gently pressing the skin graft to its new donor site with a constant, even, firm pressure By this method we were also able to prevent retraction of the penis and possible loosening of the graft The dressing was completed with a roller bandage and taped to the abdomen with the penis in a position simulating erection, the glans protruding A drainage tube was connected to the Foley catheter, which was controlled with a Hoffman clamp and drained into a bottle at the foot of the bed

Postoperative Care During the first night the patient complained of urinary discomfort without orders an extern ordered the Foley catheter Since we felt that the catheter was of great importance, as previously explained, it was replaced the following morning On the third day the patient developed a burning sensation along the course of the urethra and a slight discharge was noticed at the meatus This was treated by irrigating the urinary bladder with a penicillin solution of 5 000 units per cc of sterile water The meatus was cleansed with this solution after a rubber dam was placed about the glans to keep the dressing dry On the fifth postoperative day the Foley catheter was removed permanently because the patient constantly complained of pain and irritation along the course of the urethra and refused to allow it to remain in place On the seventh postoperative day the dressing was removed, and it was noted that the skin graft had taken completely with the exception of a few small areas which showed signs of sloughing. Most of the sutures were removed at this time The patient was re dressed daily for three days when the remaining sutures were removed Small islands of epithelium were beginning to appear where there had been previous sloughing, residual ulcerations on the glans had healed with slightly depressed areas, by secondary intention The patient was dismissed from the hospital on the eleventh postoperative day

He was seen three months later, and by that time had regained normal function and sensation with no deformity of the penis (Fig 2) Erection, intercourse, and urination were possible without pain or discomfort

CONCLUSIONS

1 Simple circumcisions cannot be minimized as to their importance, and must be watched carefully for postoperative complications

2 Chemotherapy and sufficient diet are necessary to "build up" a patient before surgery is attempted

3 Skin grafting is necessary in a case where infection has bared a large area so that scarring and distortion can be avoided

4 The skin graft must be kept dry, taut, and free from any contamination while healing

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MULTIPLE NEEDLE TATTOOS OF THE FACE

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There are two reasons for reporting this case: first, it is felt that the history is interesting in itself and second, the surgical principles involved are of interest in connection with the report by Iverson (1) regarding the removal of traumatic tattoos of the face.

Fig. 1. Dark blue tattoos on forehead, each malar region, the lower lip and the chin

A forty-six year old woman presented herself at the Henry Ford Hospital on February 20th., 1948. She stated that she had been born in Turkey of Armenian parents in 1902. In 1915, when she was thirteen years of age, she had been taken prisoner by the Arabs during their fight with the Turks. Nine of her brothers were later killed in combat.

While she was a prisoner a number of tattoos had been placed on her face. One had been placed on her right arm.

Four years later the British had removed her from Arabia and put her in an orphanage where her mother found her.

In 1920 she had come to the United States. In 1922 an unsuccessful attempt to remove the tattoos had been made by a surgeon in an Eastern city. She stated he had injected a fluid which he expected to dissolve the pigment. No further attempt had been made to remove them.

FIG. 2. After removal of tattoos by excision and sandpapering

In the meantime she had married, raised a family quite successfully, and had not been too much disturbed by her rather conspicuous appearance. However, more recently she had become more sensitive about it and on one occasion had become quite upset when two women had laughed at her while they were riding on a trolley.

On examination, dark blue tattoos were noted on the forehead, each malar region, the lower lip and the chin (fig. 1). Except for a mild anxiety neurosis, general physical examination and laboratory studies revealed no significant abnormalities.

On March 19th., 1948, with local infiltration of 1% novocaine and equal parts

of 1:1000 adrenalin, the removal of these tattoos was carried out. The circular tattoo on one cheek and the cross on the other were easily excised due to their small size. The one extending along the vermillion margin of the lower lip and downward from the corners of the mouth was excised and closed with little difficulty after undermining the skin. The skin here was thin and the pigment extended through it at most points.

Since the skin of the forehead was much thicker, the pigment did not extend through it except at one small place in the center. This place was excised while the remainder of the tattoo was removed with number one sandpaper supplemented by an emery stone.

The group of tattoos on the chin was removed by the use of sandpaper and shaving with a safety razor blade. The skin was so thick in this region that the pigment did not extend through it at any point. The depth of the pigment could be determined rather accurately by the depth of color. The darker the tattoo the deeper it seemed to be.

Vaseline gauze dressings were applied to the abraded areas and in about two weeks these areas had healed by epithelialization (fig. 2).

Menagh (2) says that when commercial tattooing is carried out by hand the pigment is usually deeper and the depth less uniform than when a machine with several needles on it is used.

I have treated one other case with a history somewhat similar to that of the above case. However, only the chin was involved and there was so much scarring due to previous treatment that it was necessary to excise the entire area and apply a split thickness skin graft.

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HAROLD LA

IN MEMORIAM

HAROLD LAURENS DUNOAS KIRKHAM, M D

The sudden death from coronary thrombosis of Dr Harold L D Kirkham, one of the country's outstanding plastic surgeons, at his home in Houston, Texas on March 18, 1949 less than a week before his sixty second birthday shocked and saddened his many friends throughout the United States and abroad—his colleagues who knew and respected his ability as a plastic surgeon as well as his many patients scattered far and wide on whom his splendid operative results stand as a living memorial to his skill Dr Kirkham was a Diplomate and Member of the Founders Group of both the American Board of Surgery and the American Board of Plastic Surgery and served as a Member of the Board of Plastic Surgery for many years He was elected President of the American Association of Plastic Surgeons in 1938 when he was host to the group in Houston for its annual meeting

Although Dr Kirkham had suffered his first heart attack in May 1948 while en route to Boston to attend the meeting of the Association of Plastic Surgeons, he had recovered so remarkably from that attack and was again carrying a full program in the private practice he had resumed after his retirement from the United States Navy, that no one was prepared for the suddeness of his death

The son of Dr Frederick William and Delphine (Laurens) Kirkham, Dr Kirkham was born on March 24, 1887 in Norfolk, England He attended the Bedford Modern School in Bedford, England and passed the Junior Local University of Oxford Examination in England before coming to the United States and to Texas as a youth of seventeen, working his way across on a freighter He later became a naturalized citizen of this country He enrolled in the University of Texas Medical Branch at Galveston from which he was graduated in 1909 He served an internship in St Joseph's Infirmary in Houston before beginning his private general practice in Brownsville, Texas In 1914 he moved to Houston where he practiced until his death with the exception of the time he spent in the military service

A veteran of both World Wars, Dr. Kirkham was staunchly devoted to the Navy from the time of his enlistment in the Naval Medical Corps in July 1918 as a Lieutenant, junior grade until his retirement in October 1947 with a Captain's rank During these many years he made an admirable record In World War I he was assigned as Chief of Surgery at Hampton Roads and attained national recognition for his work

He returned to England and to London in 1925 to study plastic surgery under the eminent British authority, Sir Harold Gilhes, and other plastic surgeons Upon his return to Houston he limited his practice to plastic and reconstructive surgery, at the same time maintaining his commission in the U S Naval Reserve

In World War II he was recalled to active duty in 1941 and as Commander,

MC, U.S.N.R. became the organizer of the Medical Specialists Unit No. 48. He was promoted to Captain, MC, U.S.N.R. and made Chief of the Plastic Surgery Department at the United States Naval Hospital in San Diego, California, which became one of the leading Centers for Plastic Surgery. In 1945 he was transferred to the new United States Naval Hospital in Houston, Texas where he was made Chief of Surgery, a position which he filled with just pride until his retirement in October 1947. He also served as Executive Officer and Commanding Officer of this facility for a time.

Dr. Kirkham was the recipient of high honors from his government, including the LEGION OF MERIT which was awarded him on April 25, 1946 by the then Secretary of the Navy James V. Forrestal for his meritorious service in saving the lives of many Pacific battle casualties and for his rehabilitation work as Chief Plastic Surgeon at the San Diego Naval Hospital from 1943 to 1945.

In addition to his naval appointments Dr. Kirkham's hospital appointments were as follows: Visiting Staff Member and Chief of the Plastic Surgery Section at Jefferson Davis Hospital; Visiting Staff Member on the Plastic Surgery Section at Memorial Hospital; Consultant in Plastic Surgery at Hermann Hospital; and Consultant in Plastic Surgery for the Southern Pacific Lines, all in Houston. At the time of his death arrangements were being completed whereby Dr. Kirkham was to be the Consultant in Plastic Surgery at the Veterans' Administration Hospital in Houston which had taken over the United States Naval Hospital in February. Dr. Kirkham was Professor of Anatomy and Oral Surgery at the Texas Dental College from 1917 to 1932, and was Professor of Plastic Surgery at Baylor University College of Medicine from 1943 until the time of his death.

Dr. Kirkham thoroughly enjoyed participating in the organizations to which he belonged. He hated an argument unless it was a good one and followed to a relentless conclusion any cause in which he believed. He had attended the meeting of the Southern Surgical Association in White Sulphur Springs, West Virginia in December and was looking forward enthusiastically to the Ann Arbor meeting of the American Association of Plastic Surgeons. In February he had participated in the Tumor Post-Graduate Course conducted by the University of Texas School of Medicine at Galveston. Dr. Kirkham had been a member of the American Medical Association and of the Texas State Medical Association for thirty-three years and had served as Secretary of the Section on Surgery at the Annual session of the State Medical Association in 1924. In addition to these, he was active in the affairs of numerous other local, state and national medical and scientific societies: Fellow of the American College of Surgeons; Diplomate and Member of the Founders Group of the American Board of Surgery; Diplomate, Member of the Founders Group, and Member of the Board of the American Board of Plastic Surgery; Past President of the American Association of Plastic Surgeons (1938); American Society of Plastic and Reconstructive Surgery; American Association for the Surgery of Trauma; Association of Military Surgeons; Southern Surgical Association; Southern Medical Association; Texas Surgical Society which he served as President for two terms, 1929 and 1930; and a Founder Member of the Houston Surgical Society. He was an

Honorary Life Member of the Rotary Club, a member of Brae-Burn Country Club and was listed in Who's Who in America.

Dr. Kirkham was a man of many talents developed to a high degree. His gifted hands could restore the broken bodies of the battle wounded, paint a lovely landscape of the quiet English countryside or play the notes of the sweetest symphony on the strings of his violin with equal skill. Though a busy surgeon, he found time to develop his talent for painting. He had an uncanny knack for painting landscapes and portraits and exhibited his paintings in national art shows. In 1939 he was awarded a prize by the American Medical Association for one of his works entitled "The Three Monks" which was exhibited in New York City. The painting was reproduced in Mead-Johnson and Company's book, *The Paragon.*

He was an accomplished musician and played the violin in the Houston Symphony Orchestra for five years. Dr. Kirkham was a sports enthusiast and his voice was known to thousands of baseball fans because he was a rooter. He enjoyed swimming and was known on the golf links not only at home but wherever he visited because his golf clubs always accompanied him on his trips. His many trophies attested to his proficiency in the sport—he had won the Texas Surgical, the Southern Surgical, the Southern Medical and the American Medical Association golf titles. He loved a challenge, whether it sprang from some terrible deformity or burn disfigurement or from a game of bridge or chess or golf.

Dr. Kirkham was a friendly, fun-loving man who loved life and lived it abundantly. He was always ready to go places and to see things. He liked people, laughter and crowds around him, and people instinctively liked him. He numbered among his friends people in all walks of life. He liked good conversation and could spin a yarn as well as the best. Little groups would gather around him at the sound of his familiar "Have you heard the one about ———?" Then in his inimitable style employing all the necessary flourishes and embellishments he would entertain for an entire evening a crowd which grew larger and larger with each new story. In this he reveled. He could produce a story to fit any occasion, and any story was a good one for his telling it. The ones in his repertoire were really gems.

Dr. Kirkham is survived by his wife, Mrs. Margaret S. Kirkham; a son, Harold B. Kirkham; three daughters, Mrs. Charles A. Brokaw, Miss Margaret Kirkham, and Miss Elizabeth Kirkham; and two grandchildren, all of Houston; and a brother, F. T. Kirkham, of San Antonio, Texas.

The achievements of Dr. Kirkham will secure for him a place among the greatest plastic surgeons, and the human friendliness of the man will secure for him an everlasting place in the hearts of the people whom he loved so well.

S. BARON HANDY, M.D.

BOOK REVIEW

Dupuytren's Contracture with special reference to aetiology and improved surgical treatment, its occurrence in epileptics, Note on Knuckle-Pads, Tord Skoog, Acta Chirurgica Scandinavica, Vol. XCVI (96) Supplementum 139. Uppsala, Sweden, 1948.

This small paper-covered monograph of 175 pages and 50 illustrations treats with thoroughness most aspects of Dupuytren's contracture. A careful and complete review of the literature has been made, giving as many as 410 references. Also, the author undertook a tabulated study of 50 cases, operated on 10, and advanced some of his own theories. The work was commenced in 1946 when the author was with Sir Archibauld McIndoe, in England. In the chapters are found anatomy and embryology, incidence and symptomatology, pathology and pathogenesis, similar conditions, association with epilepsy, aetiology, theories, and treatment.

Skoog found the palmar fascia beginning in a 1.9 centimeter embryo and already with septa in a 6.5 centimeter one. With an incidence of 1.5%, Dupuytren's contracture is 7 times more common in males and usually starts in persons between 30 and 70 years of age. In 55% it is bilateral.

The author advances the theory that the breaking of fibers of the palmar fascia in ordinary use is followed by hemorrhage, round cell production and increase of collagen strands, thus forming a nodule and resulting in increase of the contracture. Plantar fascia involvement was found in 18% of his 50 cases. It was in the medial side of the foot and did not contract the toes. Forty-four per cent showed knuckle-pads and 5.6% of 86 cases of Dupuytren's contracture with epilepsy showed Pyrone's disease. Lund, who found Dupuytren's contracture in 50% of 190 males with epilepsy, and Skoog, who found it in 42% of 207 of such patients, advanced the theory that the barbiturates used in the treatment of epilepsy may cause Dupuytren's contracture.

In aetiology, heredity plays a definite part. Trauma does not cause the contracture but he thinks it may influence it in people who are predisposed to the condition.

In treatment, nonsurgical methods are not advisable. Complete excision of the fascia is advised. A Z-plasty in a contracted finger as used by McIndoe is a very useful procedure.

There is no other publication on Dupuytren's contracture which is so thorough and gives such an exhaustive review of the literature.—Reviewed by Sterling Bunnell, M.D., June 30, 1949.

SCALP AND FACE

Ardao, H A   Reparation of Scars of the Scalp (La reparación en las cicatrices del cuero cabelludo) *Bol Soc de Cir del Uruguay, 19 456, 1918*

As pointed out by Ardao, the scalp has a very thick dermis, with good vascularization and deep hair follicles It is connected to the epicranial fascia by fibrous formations The fascia and the scalp together form one anatomical layer which cannot be functionally separated Under the fascia there is a sliding layer, almost avascular, in close contact with the cranial bone Each layer has its independent circulation

The scalp is often avulsed in traumas exerting traction on the hair The layer of avulsion is between the fascia and the periosteum Burns which destroy the skin and the hair follicles result in scars adhering to the bone The removal of tumors or their treatment with physical agents also result in hairless scar tissue

Alteration of function of the scalp depends upon the fixation of the scar to the bone surface The scar tissue is often very troublesome and may become easily ulcerated by friction But the worst effect of this lesion is the esthetic result It is worse in women than in men but it is easier to repair in the former

The best plan of repair for the defect is the rotation of flaps which bring the normal hair bearing scalp from the rear to the front The growth of hair will cover the secondary defect, which can be primarily grafted Very long flaps may be cut if one bears in mind that the scalp has a very rich vascular net consisting of eight arterial pedicles (nasal superficial temporal posterior auricular and occipital) which feed its circulation The flaps may have a width less than one third of the total length without danger of necrosis

Ardao ends his paper with the case of a woman with burn scars of the scalp due to boiling water. In the first operation a parieto-occipital flap was cut, its transposition being followed within four weeks by flaps from the other side. Repair required a total time of two months; the result was very satisfactory.

Wilson, J. S. P.: Serial Excision (As Applied to a Naevus of the Cheek). *Brit. J. Plast. Surg. 1:* 117, July, 1948.

The principle of multiple excision, first recorded by Morestin in 1915, was applied in the case reported by Wilson. The child had a pigmented nevus on the right cheek measuring 4.2 by 3 cm., which extended from the level of the zygomatic arch to the upper border of the mandible.

An excellent end-result was obtained by three operations.

Phillip, A. J. B.: Facial Injuries Followed by Meningitis, with Recovery. *Brit. J. Plast. Surg. 1:* 172, Oct. 1948.

In a case described by Phillip, there was a history of a 17-foot fall, with soft tissue injuries from the middle of the forehead hairline to 1 cm. to the left of the symphysis. Wounds of the nose, tip, upper and lower lips, and chin were full thickness. The forehead wounds exposed the frontal bone, but there was no visible fracture. The wounds were grossly impregnated with coal dust.

The patient was operated upon 12 hours after injury; a general débridement and suturing of lacerations in layers were carried out. The patient's condition was satisfactory until the fourth day, when he developed signs and symptoms of meningitis. Prior to the development of meningitis the patient received 2,700,000 units of penicillin intramuscularly and 6 gm. of sulfadiazine. Following signs of meningitis he received 8,600,000 units of penicillin intramuscularly, 90,000 units intrathecally and 24 gm. of sulfadiazine. Recovery was complete.

MOUTH, TONGUE AND MANDIBLE

Pietropinto, J., and Apolo, E.: Repair of the Vestibule of the Mouth with Free Skin Graft. (El injerto libre de piel en la reparación del vestíbulo de la boca.)

Bol. Soc. Cirugía del Uruguay, 19: 386, 1948.

Pietropinto and Apolo view the resolution of some plastic problems of the lip as requiring the repair of the gingivojugal sulcus as a preliminary step. This is done to give the lip the mobility which its function requires.

Physiological and pathological conditions can cause the vestibule of the mouth to disappear. Physiological factors are concerned in the reabsorption of the alveolar process, the exaggeration of which makes construction of a prosthesis very difficult. Repair of the depression of the vestibule provides a perfect surface to hold the prosthesis in place. Pathological conditions in which repair is indicated are loss of substance of the lip because of cancer, gunshot wounds, retracting scars following a harelip operation, tumoral or infectious conditions which involve the alveolar border and fix the neighboring soft tissues, and so forth.

The absence of the vestibule causes alterations in speech and mastication, drooling of saliva and of food, *et cetera*.

The authors advocate the following technic for correction of a toothless mandible:

An incision is made parallel to the alveolar border, without reaching the periosteum, and where the mucosa is looser. Near the mental nerve the incision describes a curve with lateral convexity to provide a flap including the nerve. The inferior border of the maxilla is reached with blunt dissection, thus creating a new vestibule, which has to be lined with a free skin graft. Pietropinto and Apolo prefer taking the skin from the internal aspect of the arm, which is without hair follicles. The graft is laid on a dental compound mould which has been prepared, pressing it over the raw surface. The dental compound mould with the skin lining is attached in place. The borders of the mucosa from the lip to the alveolar border are sutured. A few examples are shown in which this technic has been used successfully.

McLaughlin, C. R.: Reduplication of the Mouth, Tongue and Mandible. *Brit. J. Plast. Surg. 1:* 89, July, 1948.

An extremely rare situation is reported by McLaughlin, a child having a secondary mouth and tongue on the right side of the jaw, at the level of the horizontal ramus.

The orifice measured 2 cm. in diameter, complete with a sphincter mechanism which acted coincedentally with the sucking action of the child's primary lips. In the centre of this mouth was a muscle mass resembling a tongue. Roentgenographic study revealed an extra mandible fused to the normal mandible. The posterior part of the upper surface of this accessory mandible showed the likeness of a normal mandible and contained eight tooth buds.

Excision of the entire accessory mouth, tongue and mandible was done at the age of three months.

The literature of polygnathism was surveyed and only one example was found which corresponds at all with the case presented in this article.

EXTREMITIES

Edwards, Sterling: Evaluation of the Open Jump Flap for Lower Extremity Soft Tissue Repair. *Ann. Surg 128* 1131, Dec 1948.

As pointed out by Edwards, the usual method of repairing subcutaneous defects of the lower extremities, when these defects are too extensive to be repaired by the use of local tissue or cross leg flaps, requires the migration of an abdominal tubed pedicle.

The author describes the open jump flap. A rectangular abdominal flap is raised and dissected back along the deep fascia to preserve the blood vessels running just above the fascia. This flap is so placed on the abdomen that the forearm can be comfortably attached with a minimum of tension. Another rectangular flap of the same width is raised on the forearm. This flap should be 1 to 1½ inches in length so that when it is turned back an open area of 2 to 3 inches in length and of the same width as the abdominal flap will be present for attachment of the abdominal flap. The two flaps are then sutured together and the open area on the abdomen is covered with a skin graft. Subsequently a flap of the required size is outlined on the abdominal wall, and after suitable delay this open flap is transferred to the lower extremity and carefully sutured in the defect left by the excision of the scarred area. After one further delay the flap is severed from the arm and sutured in place covering the defect. The flap on the arm is

resutured at this time and usually leaves little more than a linear scar.

Edwards reviews the factors involved in 26 open jump flaps and 33 abdominal tube pedicles. Open jump flaps were completed in an average of 104 days and six operations, as compared to an average of 333 days and ten operations required for completion of the abdominal tube pedicles. One open jump flap was partially lost as compared with seven unsuccessful abdominal tube pedicles.

Mowlem, Rainsford: The Treatment of Lymphoedema. *Brit. J. Plast Surg 1* 48, April, 1948.

Edema following obstruction from whatever cause appears to be confined to the tissues superficial to the deep fascia. Mowlem explains this on the lack of collateral lymphatic circulation. Three phases of lymph oedema are emphasized:

(1) Swelling occurs peripherally, is soft, does not pit easily, and recedes with rest and elevation of the part. This type of swelling extends towards the trunk, and as it does, the second phase appears peripherally.

(2) Pitting occurs and persists. Dilated vessels become fibrosed and skin changes appear.

(3) Pitting is elicited with difficulty, the lymphatics are completely enveloped by the fibrosis that their incompetence has induced, and the whole subcutaneous layer is a mass of sclerotic tissue.

Treatment depends upon the phase of the lymphatic obstruction.

(1) Creating a lymphatic bridge by a pedicle raised in the midaxillary line from the dome of the axilla to the umbilicus. It includes the full thickness of subcutaneous tissue. It is moved into its new position so that the correct axial flow of lymphatics is maintained and so that its lower end is embedded in the obstructed limb, while the upper end lies in an area drained by intact lymphatics.

(2) Relieving the lymphatic tension and halting the progress by application of method in Phase 1.

(3) Removing the damaged skin and subcutaneous tissue and replacing it with healthy skin implanted upon the intact deep fascia.

Clinical results in 18 cases are reviewed.

In two cases of edema of the arm (postoperative) a pedicled flap to bypass the axillary obstruction has been used. So far the bulk of the arm has not decreased though the tenseness of the swelling has been improved. In the leg cases, there appears to be a tendency to consistent, progressive improvement.

Moore, F. T.: The Technique of Pollicisation of the Index Finger. *Brit. J. Plast. Surg. 1:* 60, April, 1948.

As stated by Moore, loss of the thumb is a crippling injury, only equalled perhaps by loss of all the fingers of the hand. The author evaluates the various operations attempting to restore prehensile activity and concludes that the method of choice in the majority of cases is the transfer of the index finger to the position of the thumb stump.

The currently used methods to restore opposition of the thumb are outlined and the author's technic for policisation is reviewed. It is divided into five stages:

(1) Preparation of a dorsal flap to line the ulnar side of the transposed index finger.

(2) Establishment of a cleft between the metacarpal bones of the index and middle fingers.

(3) Division of the metacarpal bone of the index finger.

(4) Preparation of the bony stump of the thumb for reception of the new thumb.

(5) Fixation of divided bone ends.

The article is well illustrated.

Oldfield, Michael C.: The "Horse-shoe" Web Flap in the Treatment of Syndactyly. *Brit. J. Plast. Surg. 1:* 69, April, 1948.

The "horse-shoe" or U-flap is raised from the dorsum of the fused fingers, as described by Oldfield. The base line of this flap corresponds in level to the dorsal web base of the normal fingers, which is very proximal to the palmar web line. The flap extends distally almost as far as the first interphalangeal joint of the fused fingers and is made with a wide curved distal extremity without any sharp angles. Lateral flaps are then outlined largely to cover the more important finger, and the raw surfaces are covered with full thickness grafts.

The age and indications for operation are discussed briefly.

MALE ORGANS

McIndoe, Sir Archibald: Deformities of the Male Urethra. *Brit. J. Plast. Surg. 1:* 29, April, 1948.

McIndoe's article deals only with urethral abnormalities which lend themselves to plastic repair, and is confined to general principles of repair and technical details of the methods used by the author.

An acceptable repair should overcome penile curvature so that satisfactory sexual intercourse can take place, enable a satisfactory stream to be projected forward with the patient standing, be devoid of new disabilities such as stricture and growth of intra-urethral hair, and finally be cosmetically satisfactory.

Physiological consideration of the dual function of the penis and urethra must always be kept in mind.

Meticulous surgical technic and diligent postoperative care are essential.

McIndoe has used consistently the Marion-Duplay method for small defects up to 2.5 cm. in the course of the urethra, while for greater losses he has used his own free graft inlay technic.

An external urethrostomy is used to divert the urinary stream.

If penile injury with urethral loss in continuity resulting in fistula formation is no more than 2.5 cm. in length, it is corrected by the Marion-Duplay method. The method of reconstruction of the penis is illustrated by one case. The congenitally short urethra and epispadias are dealt with briefly.

McIndoe reviews his method for correcting hypospadias, which consists of:

(1) Redistribution of penile skin by the Edmund's operation, performed in two stages which simultaneously correct the chordee.

(2) Urethral reconstruction done by the epithelial inlay method. Emphasis is placed on the necessity for wearing a dilator in the newly constructed urethra for at least six months except when removed for five to ten minutes for cleansing.

(3) Anastomosis of the posterior end of the new urethra and the hypospadiac meatus by the flap method.

Gillies, Sir Harold, and Harrison, R. J.: Congenital Absence of the Penis (With

Embryological Considerations) *Brit J Plast Surg 1* 8, April, 1948

Two cases of true congenital absence of the penis are described by Gillies and Harrison, along with a third borderline case. A brief and excellent review of the embryology of the male genito urinary system is given, and the specific failures of development in the three cases are pointed out

In the first case, the urethra reached the pubis at the upper level of the scrotum. The testicles were present in the inguinal canals. The urethra in the second case opened into the rectum just inside the anus. The bladder sphincter was function il. A surgical penis was constructed in both instances. A preliminary colostomy was necessary in the second case

Construction of the new penis and urethra follows the principle of a tube within a tube, the inner tube for the urethra being smaller, with the skin turned in and the outer tube for the penis larger, with the skin outward. A piece of cartilage is implanted in the fat between the two tubes. These two tubes are formed by three parallel, oblique, slightly curved incisions on the side of the abdomen and thorax, at intervals of 4 cm and 11 cm. The narrower flap is rolled with the skin inward to form the urethra and the wider flap is brought over the raw surface of the small tube to make the covering or penis. The penis is completed in stages and the defects left on the abdominal wall are covered with grafts

If the urethral opening is interior to the scrotum, the lower opening of the new urethra is sutured to the existing urethra. When the opening is posterior to the scrotum the outer end of the penile tube is brought down to the urethral stump, splitting the scrotum down the centre. If the remnants of erectile tissue are present, the cartilage graft can be so imbedded that it will be gripped by the corpora cavernosa.

Editorial Comment This article is well illustrated and the technical difficulties are thoroughly discussed. The method described has been used successfully in five cases involving the penis, congenital and traumatic and the principle has been employed satisfactorily in other conditions

MISCELLANIES

Ross, J Paterson Plastic Surgery in the Training of a Surgeon *Brit J Plast Surg 1* 4, April, 1948

Ross states that in the past the scope and character of postgraduate surgical training were determined by the inclination, enter prise and initiative of the trainee who regarded the planning of his career as his own responsibility. Today undergraduate teaching and postgraduate training must conform to certain standards obtained by following carefully planned and regulated courses of study and holding approved hospital appointments

One factor contributing to this change has been the great increase in the number of young graduates who wish to obtain higher qualifications in surgery. Another reason is the necessity to counteract the tendency to specialize before one has been adequately trained in general surgery

The young general surgeon can benefit by close association with the specialist

Emphasis is placed on the basic sciences of anatomy physiology and pathology from the plastic surgery viewpoint

The general surgeon's advanced training should bring him in sufficiently close association with the plastic surgeon to permit him to apply the principles of plastic surgery to any general surgical problem

There must be collaboration between surgical specialties and such specialists must be closely linked with an undergraduate teaching hospital

Blake, Elliot H Prefabricated Autogenous Ear Cartilages *Brit J Plast Surg 1* 220 Jan 1919

Blake had prepared four autogenous ear cartilages by placing flakes of rib cartilage in a tantalum mould buried subcutaneously when he discovered that Peer and Aufricht had considerably preceded him in the idea. The mould used is somewhat similar to the one advocated by Peer. Seven cases have been completed. there has been disappointing flaccidity in two due to insufficient rigidity and in one other case crumpling due to insufficient skin covering. The results of the remaining four cases encourage the author to continue the method

THE SAMUEL D. GROSS PRIZE

FIFTEEN HUNDRED DOLLARS

Essays will be received in competition for the prize until
January 1, 1950

The conditions annexed by the testator are that the prize "shall be awarded every five years to the writer of the best original essay, not exceeding one hundred and fifty printed pages, octavo, in length, illustrative of some subject in Surgical Pathology or Surgical Practice founded upon original investigations, candidates for the prize to be American citizens."

It is expressly stipulated that the competitor who receives the prize shall publish his essay in book form, and that he shall deposit one copy of the work in the Samuel D. Gross Library of the Philadelphia Academy of Surgery, and that on the title page it shall be stated that to the essay was awarded the Samuel D. Gross Prize of the Philadelphia Academy of Surgery.

The essays, which must be written by a single author in the English language, should be sent to the "Trustees of the Samuel D. Gross Prize of the Philadelphia Academy of Surgery, care of the College of Physicians, 19 South 22nd Street," on or before January 1, 1950.

Each essay must be typewritten, distinguished by a motto, and accompanied by a sealed envelope bearing the same motto, containing the name and address of the writer. No envelope will be opened except that which accompanies the successful essay.

The Committee will return the unsuccessful essays if reclaimed by their respective writers, or their agents, within one year.

The Committee reserves the right to make no award if the essays submitted are not considered worthy of the prize.

<div align="right">

JOHN H. GIBBON, JR., M.D.
ELDRIDGE L. ELIASON, M.D.
CALVIN M. SMYTH, M.D., (*Chm.*)
Trustees

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PRELIMINARY PROGRAM

AMERICAN SOCIETY OF PLASTIC AND RECONSTRUCTIVE SURGERY

December 12, 13, 14, 1949

HOLLYWOOD BEACH HOTEL, HOLLYWOOD BY THE SEA, IN FLORIDA

Monday, December 12

7 45 Registration
8 45 Note of Welcome Mr John Tyler, Convention Manager
8 55 Announcements
9 00 Formation of the Helix With Postauricular Flap
    Dr Michael L Lewin
9 30 The Organization and Management of a Harelip and Cleft Palate Clinic
    Dr Wayne O Slaughter
10 00 The Formation of a Division of Plastic Surgery in a Large Municipal Hospital
    Dr Walter A Coakley
10 30 The Present Status of Reconstructive Surgery in Some European Countries
    Dr Jacques W Maliniac
11 00 Mammaplasty
    Dr Edward M Haarahan
11 30 A New Approach and Solution to the Problem of the Small Pendulous Breast
    Dr Herbert O Bames
1 00 Luncheon The Ocean Terrace or Cabana
2 00 Informal Presentation of Movies
    2 00 For Ladies—Tour of Gardens
    Mr Frank Stoutenberg, Horticulturist to the Hollywood Beach Hotel
4 00 Annual Meeting of the Society
6 30 Cocktails
7 30 Annual Banquet Members and Invited Guests
9 30 After Dinner Dancing The Cabana or Flamingo Room

Tuesday, December 13

8 30 Cutaneous Antethoracic Esophagoplasty
    Dr Darrel T Shaw
9 00 Treacher Collins Syndrome
    Dr Gerald Brown O Connor
9 30 A Simple Method of Fixation after Surgical Correction of Mandibular Prognathism
    Dr Edward A Kitlowski
10 00 Nicotinic Acid and Epinephrin Test for the Source of Vascularity in Delayed Skin Flaps
    Dr Paul W Greeley and Dr George Olander (by invitation)
10 30 Correction of Advanced Rhinophyma by Means of Reconstructive Plastic Surgery
    Dr Arthur B Smith
11 00 The Surgical Treatment of the Bifid Nose
    Dr Jerome P Webster and Dr Edward G Deming (by invitation)
11 30 Median Cleft of the Lower Lip and Jaw
    Dr Albert D Davis

12:00 The Treatment of Mid-Scrotal and Perineal Hypospadias.
The Correction of Peno-Scrotal Hypospadias.
Dr. David M. Davis (by invitation).
 1:00 Luncheon. The Ocean Terrace or Cabana.
 2:00 Chartered Cruise of Venetian Waterway, 3 hours.
Other Recreation and Sports: Deep Sea Fishing; Bathing in the Surf or Outdoor
Pool; Golf; Tennis, etc.
 5:00 Executive Committee Meeting.
 6:30 Cocktails.
 7:30 President's Dinner. Members, wives, and invited guests.
10:00 After Dinner Dancing. The Cabana.

Wednesday, December 14

 9:00 Iliac Bone Grafts in the Repair of Facial Defects.
Dr. Reed O. Dingman.
 9:30 Prevention and Treatment of Wry Neck in Infants.
Dr. James Barrett Brown, Dr. Frank McDowell, and
Dr. Minot P. Fryer (by invitation).
10:00 Plastic Surgery of the Eyelids.
Dr. Frederick A. Figi.
10:30 The Fate of Human Autogenous Septal Bone Grafts Buried in Human Tissues.
Dr. Lyndon A. Peer.
11:00 Causes of Failures in Iso Grafts of Human Skin.
Dr. Beverly Douglas.
11:30 Further Studies in the Treatment of Skin Defects by Abrasion.
Dr. Preston C. Iverson.
12:00 Research Opportunities with the Use of Cultures of Living Skin.
Dr. Truman G. Blocker, and (by invitation)
Dr. C. M. Pomerat and Stephen R. Lewis.
 1:00 Luncheon. The Ocean Terrace or Cabana.
 2:00 Recreation and Sports.

A news letter regarding the meeting, the Hollywood Beach Hotel, reservations and accommodations, travel facilities, recreation, sports, etc., will be sent in September to members of the Society.

Dr. Kenneth Pickrell, *Program Chairman*
Duke University
Durham, North Carolina

THE REPAIR OF THE BILATERAL CLEFT LIP

WM C HUFFMAN, M D AND D M LIERLE, M D

University Hospitals, State University of Iowa, Iowa City Iowa

Truisms stand in little danger of becoming hackneyed Attention cannot be called too often to the basic principles of any type of surgery, especially when these tenets are so frequently ignored Although nearly all of the principles herein set forth and most of the procedures to be described have been advocated many times in the past by eminent surgeons, the scant consideration they often receive in practice is justification for bringing them forward again

Even though we shall offer minor variations in technique and slightly different interpretations of theory here and there, about the only contribution we can make to the subject under consideration is one of organization through free borrowing from the writings and experiences of others

Fig 1

It may be that the notoriously poor results so commonly obtained in the repair of bilateral cleft lips, particularly those complicated by premaxillary protrusion, are due to the fact that many text books recommend only one type of corrective operation This procedure is based upon rotating flaps from the lateral sides of the cleft and fitting them around the pared prolabium so that they form an appreciable part of the central portion of the repaired lip (fig 1) Perhaps this maneuver is the one of choice in certain selected cases and may be the procedure par excellence for the treatment of all cases by certain surgeons, but in our experience its use as a standard modus operandi has brought considerable disappointment

Since we used an operation of the just described type for many years we feel that we are in a position to praise or condemn it freely Favorably, it may be stated that it offers a means of early one stage closure of the lip Unfavorably, it can be stated definitely that the end result is frequently poor both from functional and esthetic viewpoints and that the one stage advantage is lost when subsequent revision operations must be done

Postoperative examination usually reveals a lip that is excessively long, narrow (tight), recessed, more or less immobile, and marred by an inverted fork-shaped scar In addition there is commonly present a broad, flat nasal tip and

FIG 2

FIG 3

extremely short columella (figs. 2a & b). Such a nose is repulsive in appearance and almost useless as an airway. It has been claimed that the nose and lip will improve remarkably as the patient grows older. We have not seen this occur

often enough to warrant consideration. It may be seen from examination of figure 3 that the patient depicted in figure 2n has had little or no improvement in appearance during a five year period.

Proof that the short columella is the cause of most of the deformity of the nasal lobule is immediately presented when one observes how the nasal tip springs into normal position as soon as a columellar lengthening releases the tension upon it (fig. 4).

We are in complete agreement with Vaughan's (1) belief that the normal processes of growth and function tend to develop tissues after they are placed in

FIG. 4. DEMONSTRATION OF THE EFFECT OF RELEASING THE NASAL LOBULE FROM THE TENSION PRODUCED BY AN ABNORMALLY SHORT COLUMELLA

correct anatomical relationship. In our opinion the short columella is commonly the result of an injudicious primary repair of the lip which has resulted in structures being so bound down by scar tissue and so deprived of blood supply that later development is impaired. The degree to which a columella will lengthen after a premaxilla is placed backward in proper position without resorting to excessive trauma is often amazing.

A statement by Schultz (2) that in a cleft lip all parts are present and need only to be put together might well be kept in mind before planning to repair a lip by the use of complicated geometric patterns gained through excessive paring and elevation.

The fact that most parents are extremely anxious to have an infant's deformity corrected as soon and as quickly as possible is a strong driving force for the surgeon to seek out a method of one stage reconstruction. We have tried long

and arduously to learn of or devise a single stage operation that would enable us to repair all complicated bilateral harelips with esthetic and functional results that we felt to be satisfactory. Our search has been futile and we have resigned ourselves to recommending multiple procedures in a majority of cases. We have found few parents who are unwilling to allow us the weeks or months necessary for several operations after an explanation that we can obtain much better end results from a long range plan. Although the repair that we shall describe could be carried out at one sitting we are in accordance with Vaughan's (1) belief that repositioned tissues should be allowed time to adapt themselves to new locations and tensions before being attacked further.

We hesitate to do any cleft repairs when an infant is a few hours or a few days old and usually defer all procedures until he is about four weeks of age. We have never seen an infant whose only defect was that of a cleft lip and/or cleft palate who could not be fed by some method during this period. By the time he is a month old he should be well over his icterus neonatorum, well above his birth weight, taking feedings satisfactorily, and better able to withstand the hazards of anesthesia and blood loss.

Since so many bilateral cleft lips are accompanied by a protrusion of the premaxilla and complete palatal cleft we shall describe the staged procedures that we have found to give the most satisfactory results in the treatment of a complicated bilateral harelip.

STAGE I. POSITIONING OF THE PREMAXILLA AND REPAIR OF THE HARD PALATE DEFECT

According to Padgett and Stephenson (3) there are two general methods of handling the forward displacement of the premaxilla. In one there is no operative interference with the vomerian support; the lip is closed and depended upon to furnish enough continuous pressure to force the premaxilla into proper position. In the other the premaxilla is set backward after removal of a portion of the overly developed nasal septum. We prefer the latter method. In cases where the lip is closed over a protruding premaxilla the suture line is apt to be endangered by extreme tension. There is no assurance that retroplacement will be in the proper planes; the premaxilla may be abnormally tilted in a coronal plane or twisted in a sagittal plane. There is obviously no chance of union of the cleft edges without subsequent surgery. Finally, the excessive amount of septum must surely buckle under pressure and lead to nasal obstruction.

At the time of positioning of the premaxilla the cleft of the hard palate is easily treated by the use of septal flaps as advocated by Dorrance and Bransfield (4).

We proceed as follows: an incision is made along the free edge of the nasal septum extending from the posterior surface of the premaxilla to the posterior extremity of the septum (fig. 5). Through it the septal mucoperiosteum and mucoperichondrium are completely elevated on both sides. Since these flaps are not reapplied to the septal skeleton some authorities believe that such elevation will result in sloughing of the septal bones and cartilage; we have not seen this happen.

After baring the septum a section of it is removed in such a way that the premaxilla can be placed easily and accurately in position The manner in which part of the septum is removed and in which the premaxilla is set back is of such importance detailed discussion is warranted The septal removal must be handled in a fashion that will permit the premaxilla to be moved directly backward "as one would close a drawer" (5) If the premaxilla is dealt with in this way (fig 6) the teeth will be able to erupt in a vertical plane, if it is tilted into position (fig 6—insert) they will erupt on a backward slant In addition to causing faulty dental occlusion a tilted premaxilla will fail to give forward thrust to the lower margin of the lip and will not produce continuous, normal tension on the columella As mentioned previously this tension frequently allows gradual
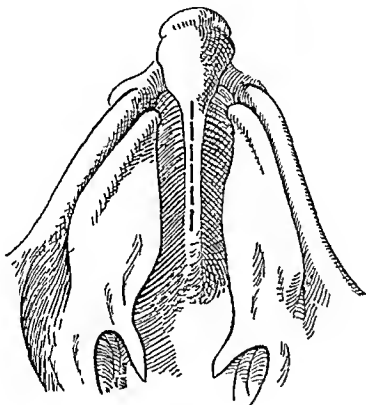
Fig 5

columellar lengthening with resultant spontaneous release of the depressed nasal tip (fig 7)

We remove with biting forceps a strip reaching from the bottom to the top of the septal skeleton and start the removal about one to one and one half centimeters behind the premaxilla Partial resection of the septum in this location gives little threat to the blood supply of the premaxilla and allows enough freedom of motion to permit that structure's proper placement The question of how wide (antero posterior measurement) a strip of septum to remove might arise First and foremost, the strip must be of sufficient width to allow positioning of the premaxilla without its being forced Whether or not removal of a strip of excessive width might be harmful we are not prepared to say There are anatomists who believe the profile projection of the nose to be due to forward thrust

of the septum during an individual's growth period. To be on the safe side we try to have the strip of such width that the cut edges of the septum will be in close approximation after posterior placement is accomplished.

It will be noted in figure 8a that from the anterior extremity of the free edge of the septum the incision has been continued forward on either side of the premaxilla. By extending these incisions up and around the lateral surfaces of the
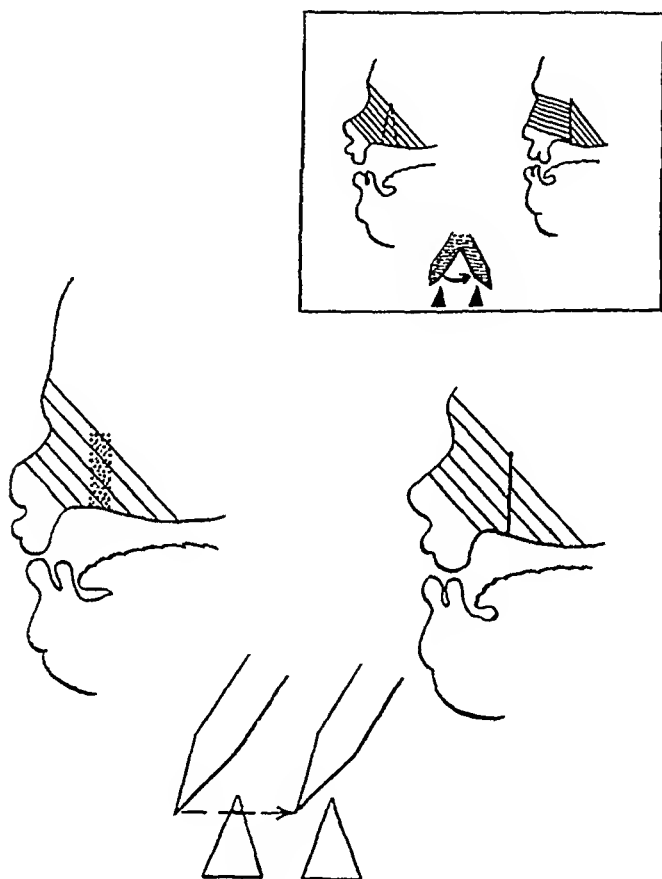
FIG. 6. INSERT ILLUSTRATES INCORRECT "TILTING" OF PREMAXILLA

premaxilla two soft tissue flaps can be developed so that they hinge anteriorly. Two other flaps, one on each contiguous surface of the alveolar cleft, can be prepared so that they hinge posteriorly. After the premaxilla has been retroplaced into the alveolar defect these flaps can be sutured into position so that they hold the premaxilla in situ and furnish continuous mucosal closure in front of and behind the premaxilla (figure 8b).

It is sometimes extremely difficult to form premaxillary and alveolar flaps without doing excessive trauma or prolonging the operation unduly. In such instances we have pared and discarded premaxillary and alveolar mucosa and

approximated the raw surfaces on each side and must admit that the results are about as good as those produced by the more precise method
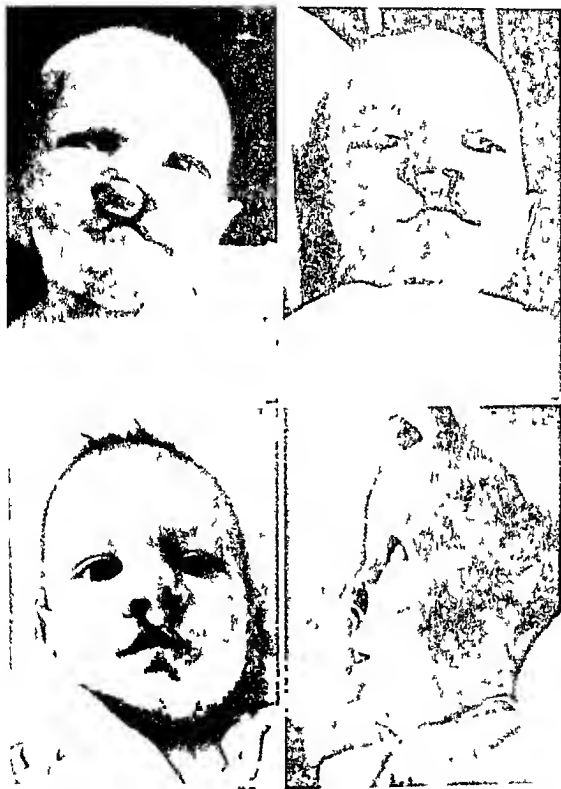
Fig 7 GRADUAL SPONTANEOUS LENGTHENING OF THE COLUMELLA AFTER RETROPLACEMENT OF THE PREMAXILLA

The previous complete elevation of septal flaps makes treatment of the hard palate cleft by the method of Dorrance and Bransfield (4), (6) a matter of but a few more minutes work In addition to saving the patient one stage of a later

multiple staged procedure we believe that it will lead to a firmer fixation of the premaxilla if done at this time. Incisions are made along the free edges of the
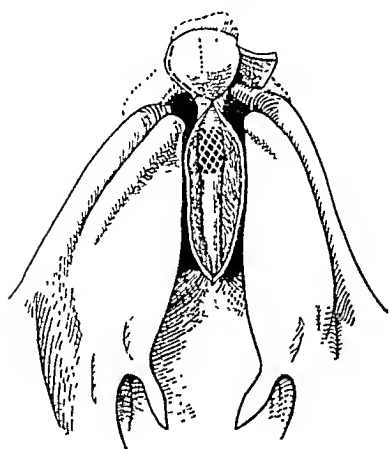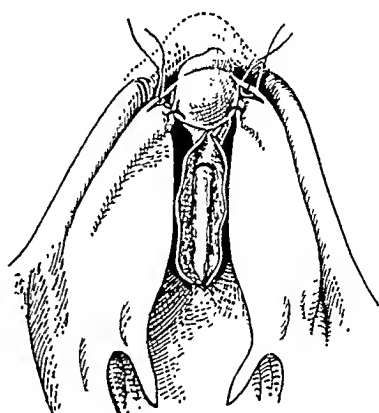
A   B

Fig. 8
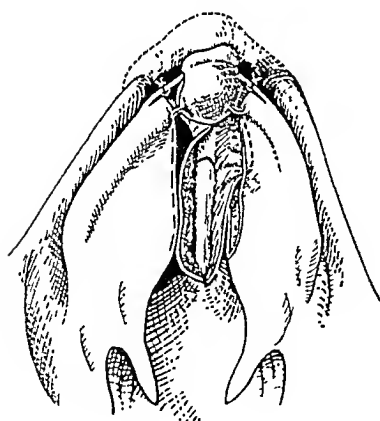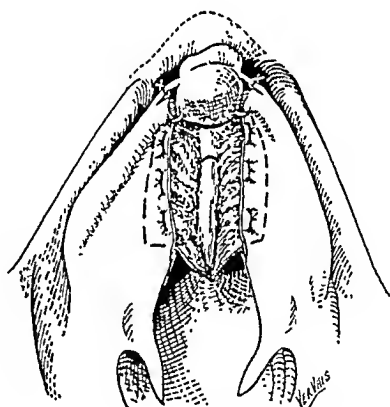
A   B

Fig. 9

hard palate on both sides of the cleft and through them palatal mucoperiosteum is elevated far enough to allow easy approximation of raw surface of septal flap to raw surface of palatal flap on the corresponding side (figure 9a). Two or three

silk mattress sutures on either side are usually enough to hold the flaps in snug apposition. (figure 9b), but care must be taken to make sure that close approximation of tissues has been gained all along the suture lines if perforations are to be avoided.

We have found that the triangular cavity created above the level of the hard palate will close by granulation in about ten days time without use of the packing recommended by Dorrance and Bransfield and Gross (7).

When all sutures are removed on the tenth postoperative day one is gratified to find the premaxilla already rather firmly fixed in its proper position. By the time the patient is ready for STAGE II this fixation has become even more solid and will usually resist quite forceful efforts at dislodgement.

It is worth emphasizing that the soft tissue bud (prolabium) in front of the premaxilla has received no definite treatment during STAGE I There is great

Fio 10

temptation to free it from the premaxilla in order to gain more working space and theoretically to allow increase in columellar length. However, the columella is not immediately or appreciably lengthened by so doing and, of more importance, the scar tissue formed between lip tissue and premaxilla is so firm and the blood supply to the prolabium so decreased (8) that the lip repair to be described later is less likely to be satisfactory.

As has been stated previously one of the objectives of STAGE I is to so place the premaxilla that the external nose will produce gradual tension on the columella—normal tension that was not exerted during prenatal development. If this concept is true one would be justified in expecting spontaneous lengthening of the columella after recession of the anteriorly displaced premaxilla so long as he has not hindered its development by lessening blood supply or binding the prolabium to the premaxilla or lateral lip segments. We therefore allow enough time to elapse between STAGE I and STAGE II to gain all possible advantage from whatever voluntary redraping of tissues may occur. This may require from

two to eight weeks. At times no such thing occurs; the columella remains short and the nasal tip stays broad and flat. Such an occurrence is indeed unfortunate but nothing has been invested except the weeks of hopeful expectancy. On the other hand, when the length of the columella and the shape of the nasal tip do change appreciably during this time the reward is well worth awaiting (figs. 10a, b, & c).

STAGE II. REPAIR OF ONE SIDE OF THE CLEFT LIP

The obvious aim of STAGE I is to change a complicated bilateral harelip into an uncomplicated one. The objective of STAGE II is to convert a bilateral harelip into a unilateral one. We prefer to reconstruct only one side of the lip at a sitting and again rely upon the effect produced by the establishment of normal tension between tissues. The manner in which the prolabium will adapt itself after being sutured to one of the normally positioned lip segments is often astounding.

The usual rule to follow in this stage is one that we adopted only after much initial timidity and after learning that a secondary lip repair is a simple matter when compared to the secondary reconstruction of a harelip nose. The maxim we observe is the correction of alar displacement as well as possible before attention is given to the lip cleft. This will often try the surgeon's courage to the breaking point. An immediately satisfactory lip closure even at the expense of a nasal reconstruction which is only tolerable is a lure difficult to resist.

The procedure is started by wide undermining of the lip, ala, and cheek on one or the other lateral sides of the cleft; the soft tissues of the nose are completely elevated to allow free sliding of tissues while the ala is being shifted into normal position (9).

After it appears that the ala can be placed satisfactorily, giving special attention to turning in the margin of the ala and elevating the point of alar-facial junction to a somewhat higher level than the columellar-labial angle, attention is directed for a time to the lip.

The raising of the alar-facial attachment in such a way that it lies in correct relationship to the posterior end of the columella frequently obviates the apparent great difference between the length of the lateral margin of the prolabium (short side) and the medial edge of the lateral lip segment (long side), a condition which makes it possible to do any one of the standard unilateral harelip operations. We happen to be partial to the basic principles embodied in the type of reconstruction described by Brown and McDowell (9) because it allows for conservation of lip tissue and lends itself so readily to wide modifications to suit the individual case (fig. 11).

The prolabium is usually of less thickness than the lateral lip segment, and mobilization and paring of the lateral side often leave less mucosa on its inner surface than is desirable. For these reasons we have formed the habit of leaving the vermillion substance on the lateral side of the prolabium as a posteriorly pedicled flap to be sutured to labial mucosa on the lateral side of the cleft (fig. 11b). It may be that the preservation of this flap is not as important as we have

led ourselves to believe, but it is comforting to look back upon a repair that has been done with the loss of little or no available tissue

The incised lip is closed in layers. Four or five interrupted silk sutures are passed so as to incorporate muscle and mucosa on either side of the cleft and are tied on the mucosal surface. The skin is approximated as far down as the vermilion border with interrupted sutures of fine nylon or silk (fig 11e)

The flap of excess vermilion substance remaining pedicled on the lower margin of the lateral lip segment (fig 11c) is inserted into the lower margin of the prola-

A   **B**

C   **D**   **E**
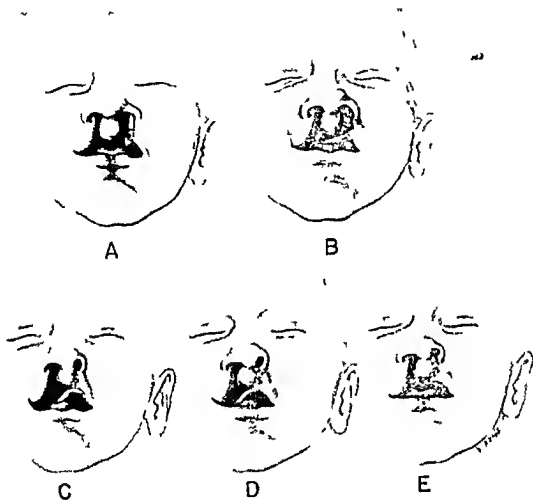
Fig 11

bium This is not done by paring any tissue from either the flap or the prolabium Following the advocation of G V I Brown (10) that the lower vermilion border of the prolabium be conserved, an incision is made from side to side along the inferior margin of the prolabium and is deepened enough (between skin and mucosal surfaces) to allow the lateral flap to be sutured into it (fig 11d & e)

If the lip cleft was very wide before repair we attempt to lessen tension on the line of repair by suturing the gingivo labial incision through which the cheek was undermined as is described in May's (11) description of Axhausen's (12) operation.

When a case is encountered in which, after the ala has been rotated and

elevated, there is still noticeable difference in length between the short medial (prolabial) and long lateral (lateral lip segment) lip margins we are not at all hesitant to hold the prolabial margin under stretch with a dural hook and procede with closure. The slight amount of tension thus produced along the line of repair does not interfere with proper healing and certainly does not result in as taut a suture line as one produced in the accepted procedure of closing a unilateral harelip over a widely separated and protruding alveolus. The gradual muscle pull exerted on a prolabium after repair in this manner almost invariably causes it to increase in size and accommodate itself to the lateral lip segment.

After the ala is properly rotated and elevated and the lip is coapted as well as possible there usually remains the problem of dealing with a buckled lower lateral cartilage. If the soft tissues of the nasal lobule have been adequately mobilized this may be satisfactorily handled at times by inserting a small pack of vaseline gauze into the nasal vestibule. At others mattress sutures through and through the ala are needed. We make the greatest effort to avoid the transection or partial excision of the lower lateral cartilage in an infant's nose.

FIG. 12. MULTIPLE STAGE REPAIR OF A COMPLICATED BILATERAL HARELIP

A waiting period after STAGE II is indicated before STAGE III and should be of sufficient length, usually four to eight weeks, to allow maximum enlargement and reshaping of the prolabium under stimulation of muscular pull and gentle daily massage.

STAGE III. REPAIR OF THE REMAINING LIP CLEFT

This stage is similar to STAGE II but is usually much less difficult. Any discrepancy between the medial and lateral margins of the cleft encountered before will be less troublesome.

We do not hesitate to cut across scar lines created in the repair of the opposite side of the lip when necessary to properly fit and adjust the side under consideration. Any tissue brought across the opposite cleft has been in position long enough to acquire an adequate blood supply without benefit of a pedicle.

If some of the excess vermilion substance from the lateral side of the cleft is needed to further lengthen the prolabium it is inserted along the inferior border of the prolabium (now formed by the flap of vermilion previously brought from the opposite side) in the same manner as before.

Since adoption of the multiple staged operations for the repair of complicated bilateral harelips our results (fig. 12) have been much better than any we ever accomplished by use of the one stage Koenig or Maas procedures, and we feel that the improvements are well worth the added time invested by surgeon and patient

SUMMARY

The objective of this presentation has been the advocation of an orderly and unhurried plan for the handling of the complicated bilateral harelip. Briefly, this procedure consists of:

1. Conversion of a complicated bilateral chiloschisis into an uncomplicated one
2. Reduction of a bilateral cleft lip into a unilateral one.
3. Reconstruction of a unilateral harelip.

There has been little need for an attempt at originality. Most of the material contained is found again and again in the literature. The way in which sound basic principles are so commonly ignored has been our only reason for recalling attention to them.

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SUCCESSFUL HOMOTRANSPLANTATION OF SKIN FROM PARENTS TO SON

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Good results are rarely seen following homografting of skin. A case is reported in which this technique was successfully employed. Padgett (1) reported 44 cases of attempted homotransplantation of skin in which donor and recipient were of identical blood groups. In only two of these patients, each of blood group IV, did grafts survive for over three months. Mandl and Rabinovici (2) described a group of six cases in which pinch grafts applied with plasma and thrombin as adherents survived after a number of unsuccessful attempts. These authors offer no explanation for success or failure in their homografting operations. They observed that transplants from a donor whose skin had previously taken sloughed when subsequent grafts were undertaken. Medawar (3-6), in his experimental studies, also observed this and suggested that it might be due to sensitization of the recipient. Homografting of skin, using identical twins as donor and recipient, has been performed successfully in a number of cases (7-11).

CASE REPORT

A nine year old boy was admitted to Evanston Hospital on October 13, 1946, eight months after sustaining a severe burn of the right leg. He was treated at home until it became infected. A month after the injury he was admitted to another hospital where, for five months, skin grafts were repeatedly attempted without success.

When admitted to Evanston Hospital the boy's tissues were wasted and his appearance toxic. His temperature was 102° F. (39°C.), his respiratory rate 24 and pulse rate 125. Laboratory examination of the blood revealed leukocytosis, anemia and hypoprotcinemia. The day after admission, under general anesthesia, his dressings were removed. A third degree burn covered with unhealthy granulation tissue and seropurulent exudate surrounded the right leg from malleoli to the upper third of the thigh (Fig. 1, 2/4/46). The donor sites of previously attempted grafts, including dermatome cuts from left chest and abdominal wall (Fig. 1, 3/5/46), deep free-hand cuts from the left thigh (Fig. 1, 4/1/46), and areas on the buttock from which many deep pinch grafts had been taken (Fig. 1, 6/10/46), all presented the same appearance as the original burn. Cultures from the exudate on this and successive occasions, showed E coli, B pyocyaneous, S albus, diphtheroids, hemolytic and non-hemolytic staphylococci and hemolytic streptococci. All areas were cleansed and necrotic tissue debrided. A number of the infected pinch graft sites were excised and primarily closed. Moist dressings were applied to all lesions and changed daily while the patient was immersed in a tub of warm water.

The patient's debility and extensive loss of skin surface would have made further denudation of skin by autografting hazardous. The patient was of the same blood group as both parents and had previously received repeated transfusions from each without exhibiting evidence of sensitization. It was therefore believed that the parents might be used as a source of skin without subjecting the patient to further risk. Accordingly, on the tenth hospital day, when improvement in the condition of the patient's burns was apparent, a thin split thickness graft was cut freehand from the inner aspect of the left forearm of each
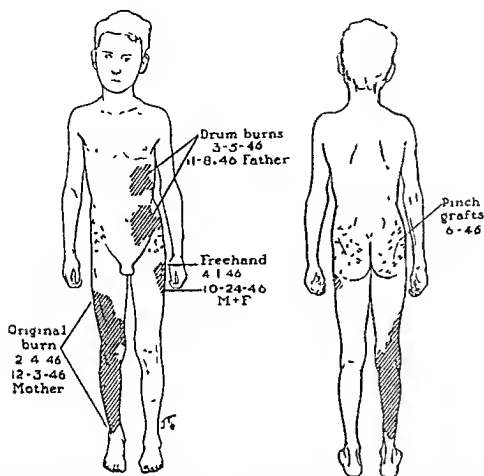
Fig 1. The dates (expressed numerically) of injury and method of production are marked above on the figure. The date of repair and source of graft below (Line drawing from original photographs of patient.)
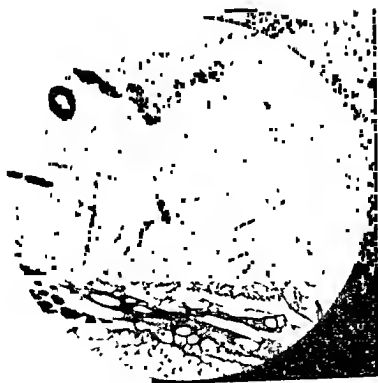
Fig. 2. Photomicrograph thru Homograft X 75

parent. These were applied to the patient's left thigh (Fig. 1, 10/24/46). On the seventh day, when dressings were removed, a ninety per cent take of the maternal graft was noted. The graft from the father which had been thicker and under less even pressure had not taken as well. These grafts persisted and subsequently the areas between them were covered by epithelium growing from their margins and the adjacent areas of the patient's skin.

Ten days after the first operation a dermatome graft of medium thickness was obtained from the father's thigh, cut into rectangular patches of postage stamp size, and applied to the patient's chest and abdomen (Fig. 1, 11/8/46). Pressure dressings were sutured in place

FIG. 3. a-b-c-d. HEALED LESIONS 1½ YEARS AFTER REPAIR

to avoid displacement by respiratory motions. When removed on the seventh day, an excellent take was observed and epithelium gradually grew over the remaining defects from the margins of the grafts as well as from the patient's skin.

On December third, 40 days after the original operation, a thin dermatome graft was obtained from the mother. A large segment of this was applied to the popliteal space of the burned right leg and the rest of the graft cut into rectangular patches and used to cover the remainder of the original burn (Fig. 1, 12/3/46). Pressure was maintained by a plaster dressing. A satisfactory take was apparent on the tenth day and Unna's paste boots were used for further dressings. At each operation, manipulation of contractures of the right leg had been performed. These gradually resolved under treatment with foot traction and exercises while in the tub.
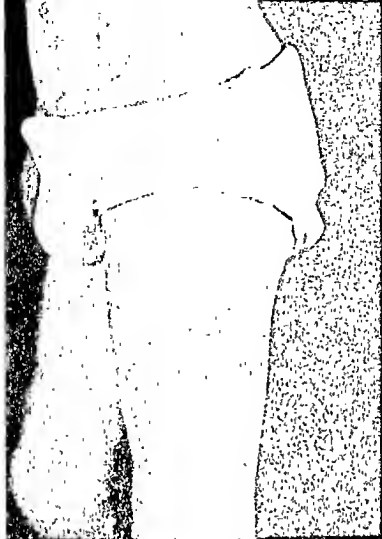
Fig 3b

On December 17, sixty-five days after admission, the red blood cell count, white blood cell count, hemoglobin and serum protein levels were normal and the boy was discharged from the hospital. Satisfactory healing continued and within six weeks dressings were no longer necessary. On May 17, 1947, five months after grafting, a biopsy of one of the homo-transplants showed normal epidermis. There was decreased cellularity and hyalin change of the dense fibrous tissue of the dermal layer with prominent vascular markings but no inflammatory reaction (Fig. 2). In February 1949 the grafts remained in place (Fig. 3) although some areas are quite thin. There is no interference with normal activity.

Fig 3d

DISCUSSION

A consistent plan of management was followed before and after operation. Wet dressings, when used, were saturated with solutions of tyrothricin, penicillin, or 0.5 percent acetic acid as indicated by appearance and bacteriologic study of the lesions. When dressings were changed in the tub, the lesions were cleansed gently with mild soap solution. Dry dressings, when used, consisted of fine mesh vaseline or xeroform gauze.

Technique at operation consisted of preparation of the recipient site by ap-

plication of eighty percent silver nitrate solution to the entire granulating bed. The deep eschar thus formed was then excised or curetted to underlying uninfected fascia or muscle Thrombin solution was applied to the clean recipient site to act as a hemostatic and adhesive agent The grafts were saturated with pooled citrated plasma and applied without sutures They were covered with fine mesh vaseline gauze, held in place with cotton waste under firm pressure with cotton elastic or plaster dressings During each operation infusions of whole blood and plasma were given At no time were antibiotics administered parenterally

We are unable to explain the success of repeated homografting from each of two donors in this instance Barker (12) has shown experimentally that animals cannot be sensitized by injection of homologous skin solutions At no time was eosinophilia, or was other evidence of sensitization observed in our patient It may be significant in this case that donors and recipient were of common descent and all in blood group IV

SUMMARY

Split thickness skin grafts were successfully transferred from each parent to a nine year old boy with extensive chronically infected burns which had been unsuccessfully treated with autografts Even though two grafts were successively applied from each donor, there was no evidence of anaphylactoid response Anemia and hypoproteinemia were treated before operation Chronic infection was combatted by local application of antibiotics Thorough and deep debridement of the recipient site was achieved by local application of eighty percent silver nitrate at operation, followed by excision or curettage of the eschar thus formed down to the uninfected layers below Grafts were prepared by saturation with plasma and applied after application of thrombin solution to the debrided recipient sites

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COMPLETE AVULSION OF SKIN OF PENIS AND SCROTUM; SURGICAL, ENDOCRINOLOGICAL AND PSYCHOLOGICAL TREATMENT*

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This type of injury to the genital organs has undoubtedly become more common with the increasing use of machinery so that, with the exception of torture mutilations, its incidence has increased steadily since the middle of the nineteenth century when Gibbs, in 1855, described the first case reported in medical literature. Since then over fifty cases of loss of varying amounts of penile and scrotal skin have been reported.

Unprotected and rapidly rotating shafts, drive wheels and gears catch the clothing of the victim who is drawn close to the machine and, in a moment, is stripped of both his trousers and the skin covering of his genitalia. In most accidents of this type the shaft of the penis is uninjured, but the thin, loosely attached skin is stripped from the coronal margin of the glans to the base of the penis. Varying amounts of the scrotal covering may be avulsed as well as one or both testicles.

The treatment of an injury of this type may be divided into three separate categories:

1. Surgical.
2. Endocrinological.
3. Psychological.

Previously published reports, almost without exception, deal with the details of surgical repair. However, two other factors noted above are extremely important not only for the immediate but also the long-term welfare of the individual. Indubitably, severe damage to the genitalia in a young man must in most cases be followed by catastrophic psychological complications, which should be treated by a psychiatrist soon after the accident for best results. Endocrine and semen studies have shown that a testis apparently normal on clinical examination may be temporarily or permanently non-functional. In the latter eventuality, replacement therapy should be started before castrate changes have become evident and have added to the unhappy mental state of the patient. A broad concept of therapy to replace the "surgical minded" viewpoint alone is important.

SURGICAL

Requirements

(a) A soft, flexible cover for the penis which will facilitate return of sensation.

(b) Provision of an adequate protective cover for the testes which will preserve their physiologic function and will permit any normal activity.

It is now generally agreed that the denuded penis should be covered with a skin graft immediately, and that the testes should be buried in pockets in the thighs or inguinal regions as a temporary or permanent site. Should the patient not be seen until several days after the accident, the purulent inflammatory exudate may be scraped off with a scalpel to a raw bleeding base. Under these circumstances, after the graft has been applied it is advantageous, as reported by Baxter, to inject a mixture of penicillin and streptomycin beneath the graft to aid the "take" on an infected surface. The most satisfactory cover for the penis is a dermatome graft 0 016 to 0 018 of an inch in thickness. This will resemble the normal skin and will be practically hairless. Scrotal flaps or pedicle flaps from more distant areas are no longer considered when resurfacing of the penile shaft is necessary

A catheter is inserted into the bladder and the penis is then stretched to its full length so that the maximum length of graft may be added. The graft is applied loosely at somewhat less than normal skin tension. Where the margins meet longitudinally, the line is broken by saw-tooth interdigitations to avoid a scar contracture. The skin at the base of the penis should be everted and several arrow head or dart incisions made at intervals about the circumference to prevent the formation of a tight constricting band at the root of the penis. We have found that if a long sleeve of the mucosal surface of the prepuce remains it is more satisfactory to excise this close to the glans and fill the defect completely with a skin graft which is also carried into darts cut in the prepuce. The result of pulling the remains of the prepuce down along the shaft of the penis may be seen in Fig 2. Sutures of fine dermalon are used to fix the graft. The glans is fixed with adhesive tape to the catheter and then a pressure dressing is applied in the customary manner and is extended over the thighs and abdomen. The dressing should be changed about the fourth or fifth postoperative day. After the tenth day the catheter is removed and only a light dressing is required. Some shrinkage of the split graft must be expected, but the initial tightness rapidly relaxes due to repeated physiologic stretching and, provided the graft is applied without tension, no difficulty should be encountered. The return of sensation in a graft of this thickness which has been placed upon a raw, nongranulating bed may be complete in two months

When fragments of the scrotum remain, these should be scrupulously preserved, for continual stretching will result in the formation of a fairly adequate sac. However, when the entire scrotum has been lost—often with a considerable amount of the skin of the perineum—the testes must be buried in the thigh or inguinal region. Moore has shown the sterilizing effect of prolonged exposure of these organs to a temperature above that normally encountered in the scrotum. Due to the thickness of a skin flap and its relative rigidity, it is obvious that a normal thermoregulatory sac cannot be constructed. However, the temperature in a reconstructed scrotum suspended on a narrow base might be low enough to permit normal function of the spermatogenic and interstitial cells of the testes

ENDOCRINOLOGICAL

The avulsion of both testicles would, of course, result in sterility and evidence of a castrate state. On the other hand, one or both testes may remain without interruption in spermatogenesis or hormonal secretion. In moderately severe injury of one testis and avulsion of the other, borderline conditions may develop. These may be investigated by assay of the 17-ketosteroids and gonadotropins in the urine, semen analysis and testicular biopsy.

Both functions of the testis are regulated by hormones of the anterior pituitary gland. At least two such hormones are involved in the regulation of the human testis. One hormone, known as the follicle-stimulating hormone (F.S.H.), stimulates spermatogenesis and is responsible for the production of mature spermatozoa. The other hormone, which is the luteinizing hormone (L.H.), stimulates the interstitial cells to secrete an androgenic substance which probably is testosterone. These relationships are shown in Fig. 8.

Under normal circumstances some of the F.S.H. appears in the urine and its quantitation serves as a useful means of evaluation of the pituitary-testis relationship. A normal adult male secretes 6 to 26 units of F.S.H. in 24 hours. In hypogonadism due to pituitary disease, the amount of F.S.H. in the urine will be less than 6 units. Since the hormones produced by the testis under the influence of the anterior pituitary hormones suppress the rate of production of these hormones by the pituitary, it might be expected that the removal of this inhibition, such as occurs in patients with testicular disease, would give rise to an increased production of F.S.H. Therefore the excretion of an increased amount of F.S.H. in the urine is indicative of primary testicular disease.

The urinary excretion of 17-ketosteroids is an index of the functional status of the interstitial cells of the testis since testosterone is metabolized to 17-ketosteroids. In the normal adult male, 10 to 20 mgms. of 17-ketosteroids are excreted per day. As shown in Fig. 8, the adrenal cortex is also responsible for secretion of hormones whose metabolites are 17-ketosteroids. Therefore urinary output of 17-ketosteroids at the best is only a rough index of testicular function.

In addition to the assay methods which have been described above, testicular function may be gauged by other criteria. Thus the condition of the seminiferous tubules may be judged by examination of the ejaculate. Evidence of interstitial or Leydig-cell failure is provided by symptoms of hypogonadism as well as signs of atrophy of the accessory sex organs such as the prostate and penis, and changes in the secondary sex characteristics. Examination of biopsy specimens of the testis is also very helpful in determining the type and degree of deficiency that may be present.

In the patient presently being described, the functional status of the remaining testicle was evaluated by the methods described above. On several occasions, as shown in Table I, the urinary F.S.H. concentration was well above normal. In one instance it was positive at a level of 150 units which is well above the normal range of 6 to 26 units. It may be concluded therefore that the remaining testicle was not functioning adequately. Whether the functional impairment involved the spermatogenic cells or the Leydig cells could not be

determined by this method, since it is not known with certainty which component of the testis is responsible for the suppression of F S H production by

TABLE I

DATE	17 KS MG./24 HRS	CREAT ININE GM./24 HRS	GONADO TROPINS (URINE) M U /24 HRS	SEMEN EXAMINATION	TESTICULAR BIOPSY
1948 Nov 6	16 3	1 8	52 8	Vol 3 cc Viscosity slightly decreased Turbidity markedly decreased Count A number of large drops examined under both low and high power No spermatozoa A few pus cells present	—
Nov 18	19 8	1 5	—	—	—
Nov 19	17 7	1 57	—	—	—
Nov 20	—	—	52 8	—	—
Dec 13	—	—	150 0	—	—
1949 Jan 17	—	—	—	Vol 5 cc Slight decrease in viscosity Turbidity greatly decreased Count Several large *drops examined under* low and high power No spermatozoa A few pus cells	
Jan 22	—	—	—	—	Pathological report Seminiferous tubules show irregular pro liferation of cells and little evidence of com plete spermatogene sis Some tubules are well formed and show nearly mature sperm atozoa The interstit ial cells are decreased in number
May 23	—	—	52 8	—	—
June 10	10 0	1 5	45 0	Vol 3 cc Slightly turbid and opalescent Count No mature or im mature spermatozoa were seen	—

the anterior pituitary It is known, however, that patients who are suffering from severe atrophy of the seminiferous tubules with minimal changes in the Leydig cells do excrete excessive amounts of F S H The urinary 17-ketoste-

roids, although fluctuating somewhat (Table I), were within normal limits. This does not exclude the possibility that the Leydig cells in the remaining testis were absolutely normal, since the adrenal cortex may compensate for the deficient production of testosterone by the testis. Therefore the status of this patient, based on the assay results, was thought to be as shown in Fig. 8. Recently, the F.S.H. level has been approaching normal.

Confirmation of the fact that there was tubular damage was provided by the examination of the semen which revealed the complete absence of spermatozoa, four, seven and twelve months after the accident. That the azoospermia was not due to a block of the vas deferens was revealed by an examination of a biopsy specimen of the testis. Microscopic examinations indicated severe atrophy of the seminiferous tubules as well as complete absence of spermatozoa in these tubules.

In the event of permanent injury to the testes, normal hormonal relationship may be maintained by injecting pellets of testosterone intramuscularly at 4-monthly intervals, thus avoiding castrate and psychologic changes.

PSYCHOLOGICAL

Besides the shock from blood loss and physical trauma, these patients experience deep psychologic injury. Quantitatively, the degree is probably inversely proportional to the age. Some authors claim that older men with families were unconcerned about the loss of a scrotum and welcomed the infertility because of an adequately large family. In some instances this reaction was probably sincere, in others a defense mechanism may have been at play. Young men seem to suffer much more severe psychic trauma and the response would be conditioned by their previous experiences; on the one hand a profound depression might result or, conversely, a tendency to minimize and gloss over the accident would merely represent an effort to suppress the psychologic trauma, and this might lead to a serious mental breakdown.

A psychiatric consultation should be obtained and appropriate therapy carried on coincident with the surgical reconstruction. Particularly those patients who have a tendency to gloss over the emotional impact of the injury should be given an opportunity to reach an adequate abreaction, and to regain true self-confidence.

In patients where is is important to preserve fertility and where, for psychological reasons, scrotal reconstruction is imperative, the following case illustrates the use of a pedicle flap from the thigh as well as skin grafting:

Case E. L. Age 17 years. While working in a sawmill, the patient's trousers became entangled in the revolving shaft of a planer. He was given first aid and definitive treatment was carried out shortly after arrival at hospital nearly two days after the accident.

On examination it was found that the right testicle, the entire scrotum and the skin of the penis had been avulsed. Some skin and subcutaneous fat had also been lost over the lower part of the pubic region, and this extended posteriorly to within 1 cm. of the anus (Fig. 1). The entire wound was covered with a greyish, purulent exudate which was carefully scraped off with a scalpel down to a fresh bleeding surface. Nearly two dermatome drums of skin, 0.016 of an inch thick, were applied to the denuded area in the pubic region

and on the penis The mucosal inner surface of the prepuce which was not avulsed was turned back to cover part of the shaft of the penis It was considered that this tissue, with its nerve endings, would be physiologically more normal than a skin graft, but subsequently it was found that the marked oedema which developed necessitated replacement of the remainder of the prepuce with a skin graft The perineum was repaired by undermining and approximating flaps in the inguinal region (Fig 2)

Approximately 95 per cent of the grafts took The patient stated emphatically that he would not return home without a scrotum Accordingly a transverse pedicle flap of adequate dimensions was outlined on the right thigh and was delayed to ensure an abundant blood supply This was then snuug into position on the perineum just posterior to the base of the penis A tendency toward constriction of the penis at this point was relieved by raising small flaps from the perineum and extending a short distance down the posterior surface of the penis The raw area on the right thigh was then covered with a skin graft The pedicle

FIG 1 The severity of the injury is indicated by complete avulsion of the skin of the penis and scrotum with loss of one testicle and some pubic and perineal skin

flap was severed at its base gradually, and the flap was adjusted to form a skin sac suspended from a rather narrow attachment (Figs 3, 4 & 5)

Subsequently, the remaining testicle was transplanted into the reconstructed scrotum (Fig 6)

While the skin graft was healing with a retention catheter in place the patient experienced frequent erections which were fairly well controlled by spraying the thighs and abdomen with ethyl chloride Contrary to the report of Vermooten, we found that the use of 6 mgms daily of diethylstilboestrol plus the administration of bromides in usual dosage did not prevent or even decrease the frequency of erections This is not surprising since an erection is largely psychological in origin

The remaining testicle was situated below the external inguinal ring, and on palpation appeared to be normal in size and consistency The temperature on the superficial surface beneath the skin was 95 6°F , and on the deep surface of the testicle it was 96 2°F , as determined by a copper constantin thermocouple However, on two occasions a semen specimen showed azoospermia This was thought to be due to nonpatency of the vas, but the steadily rising values of gonadotropins in the urine shown in Table I indicated the severe damage suffered by the interstitial and spermatogenic cells Testicular biopsy helped to elucidate this matter and showed some seminiferous tubules to be atrophic, while others

were relatively normal in appearance (Fig. 7). No mature spermatozoa were found. Normal interstitial cells were seen but were somewhat reduced in number. The fact that the gonadotropins were falling to a lower level in the last specimen appeared to indicate an improved response on the part of the interstitial cells of the remaining testis, with the

Fig. 2. Result of repair by 0.016 inch thick dermatome skin graft from the thighs approximately two days after the accident. Preparation and delaying of a pedicle flap to replace the scrotum is shown.
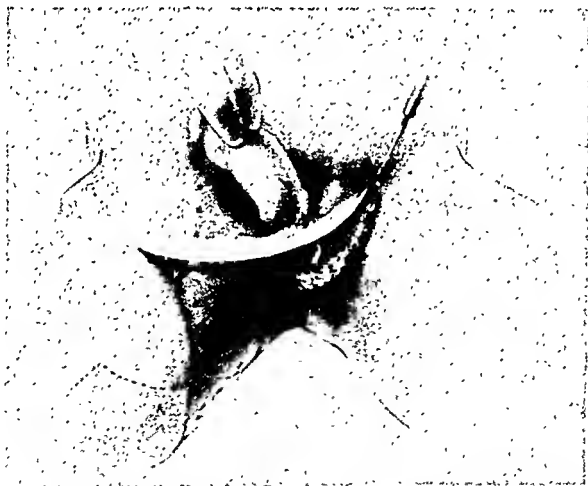
Fig. 3. The distal end of the pedicle flap is attached to a narrow base at the root of the penis by raising a U-shaped flap on the perineum.

possibility of complete restoration of function, although viable spermatozoa have not yet been found in the semen.

Psychiatric evaluation. The patient was a bed-ridden young man who appeared to be about the stated age of 17 years. He had a rather serious expression, as anyone with his condition would have, and at the beginning of the interview he was definitely reserved—

as if he were on guard. The examiner gathered the impression of being 'looked over', that the patient weighed every word first before he committed himself. However after the first five minutes or so there was a definite thawing and the patient reacted much more

FIG 4 The proximal end of the pedicle flap is severed and a similar U shaped flap is raised on the right side

FIG 5 The posterior surface of the reconstructed scrotum is closed with sutures in the form of an inverted T

spontaneously. During the latter part of the interview there was no longer a suggestion of distrust or of concealment. However at first his answers were rather pat noncommittal, and even evasive. He gave a description of his injury as recorded in the surgical history and stated that he was never unconscious and walked away.' He denied that it was even painful. When asked whether it affected him emotionally during the period in hospital or before, he also denied this. In this connection he made the somewhat peculiar statement

"If it were shot it would be different from torn. It would have been the whole works."
Somehow he evaded enlarging on this statement any further.

Fig. 6 The collar of oedematous preputial mucosa which covered the distal part of the shaft of the penis has been removed and replaced by a skin graft 0 018 of an inch in thickness. Both proximal and distal margins of the graft were lengthened by the insertion of dart-shaped relaxation incisions to prevent the formation of a ring contracture. The testicle has been replaced in the new scrotum.

Fig. 7. Some seminiferous tubules show irregular proliferation of cells and little evidence of complete spermatogenesis. Other tubules are well formed and show nearly mature spermatozoa. The interstitial cells are decreased in number.

His father is 45 years of age and works in a garage. He said that his father is not quite well; he has "trouble with his back" and "water on the knee", and he once "broke a ligament in his back". He also stated that his father is nervous; he is particularly afraid of

heights and cannot go up to the top of a high building He is also afraid of guns—"He is scared the thing will come back", and he takes his eye away from the gun before he pulls the trigger When asked whether his father ever goes into a temper, the patient replied "Quite often" His mother is 39 Regarding her physical health he only knew that she suffers from varicose veins She is also "nervous", and in her case it shows in the fact that she cries easily When asked whether the parental marriage is happy the patient replied "In a way it is   as a matter of fact it is   if it is not, it is due to the children" By this
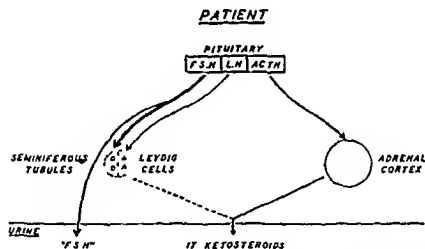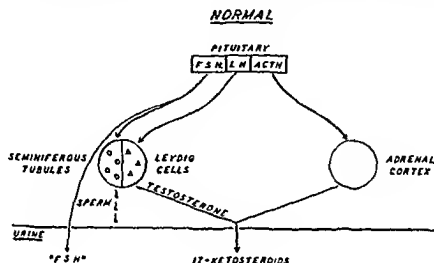
the interaction of the hormones secreted by the , both in the normal individual and in the patient

last statement he meant that the large number of children upsets them or makes them nervous Somewhat later during the interview he said that his parents were "married three times", not to any other person but to one another When asked to explain this he said that due to the fact that his mother's religion was originally different they had to go through various formalities There were 13 children altogether Two having died, there are now eleven alive The patient is the third of the 13, and the eldest boy He has one older sister age 20 who is married and has one boy, and one other sister age 19 who is married and has one girl and one boy The two children who died were girls, one died at an age the patient does not remember (from eating pills which a boarder had left on the window sill), the other one died in early infancy from a malformation

As a child he had always been afraid of the dark: "Even now I could not be alone in the woods in the evening. I could not be alone in a room at night until two years ago." He is also always nervous when going into a building he has never been in before, but is unable to explain this feeling. He has always been very frightened of fires, which fact he attributed to a big fire he once witnessed at night. He had never been frightened of thunderstorms. He suffered from enuresis until the age of 12. He bites his fingernails once in a while. About temper tantrums, he said that he has these even until the present: "It doesn't take much to make me mad." He went to school until the age of 15; most of the time he did not like it. He liked ball games, partieularly softball. He does not swim: "I just didn't like it." He left public school after the eleventh grade. At the age of 15 he began to work on a farm 17 miles away from his home, and he enjoyed this work for 2 years until he left to work in a sawmill, where he sustained his most recent injury.

His sex development (secondary sexual characteristics, etc.) took place at about the age of 14. Masturbation also began about that time. He was somewhat evasive about this, as any boy of his age might be, but he denied that it was ever a great "bother" to him, and

Fig 9 a. and b. Right and left views showing final result.

he had no impression of undue guilt-feelings. He denied ever having been exposed to homosexual activities. He was always bashful about asking a girl to go out with him. When he went out to a dance he only looked on. "I went out with a girl but I was not in love". He did not appear to have any outstanding forms of recreation. "I just run around". By this he seemed to be referring to such things as visits to dance halls. His main reading matter were the comics and he liked to listen to the radio. He is a Catholic. He goes to Mass every Sunday and to Confession and Communion twice a month (it suggests a rather religious trend). It was indicated above that the parents were of different religions, the mother being an Anglican, and he feels that even now, although the mother is a believing Catholic, the father is "more religious" than she.

With regard to his health history, it is noteworthy that the present injury is the third one within two years. Two years ago a tractor ran over his left foot so that he was unable to walk on it. The foot was swollen for a week. In April this year, while cutting wood on the farm, he struck the axe into his foot. He and another fellow were "slabbing together" and it seems that they were not sufficiently synchronized. The present injury occurred less than three months after this incident. He said that even before this present injury he often had day fantasies of parts of machinery flying off. These fantasies were of such a violent nature that he would be sweating. When asked whether this fear of violence had any other connotations, he replied: "I hit my brother once. I can't hit anyone, I am afraid of killing people. He staggered, fell down and was "knocked out" for a moment (this happened 5 to 6 years ago). Ever since then I couldn't hit a fellow."

During this first interview he reported, after much bashful hesitation, a *dream*: He had

sexual intercourse with one of his sisters, and she died from this After that he had sexual intercourse with another one of his sisters who did not die At that moment the mother appeared on the scene and said "If you do this to anyone, do it to me"

Rorschach Record			Case E L, age 17 8th November, 1948	
9 43				
I	25″	Bat (These holes here wouldn't be in the bat, not much of a head either)	W	F	A	P
II	70″	Rej I can't think of any thing				
		Unless it's part of a man's stomach (upper part, red D, the way it's shaped)	D	F—	At	—
		Lim 2 dogs		{+		
III	15″	The same, lower parts of the stomach (except the upper D)	W—	F—	At	O—
IV	20″	From the top part it looks like a bear luds (more like from the inside?)	D	F→Fc	Aebj	→O
V	2″	Butterfly (in the book)	W	F	A	P
VI	70″	I can't get anything out of that one [Upper part fox feet)	Rej {D	F	Ad]	
VII	75″	I can't see anything in it	Rej			
VIII	30″	Something like up here in the chart	W—	F→F—	At	
	75″	2 animals on each side, could be bears (like em blem)	W, D	F emblem,	A	P
IX	55″	Nothing unless it's part of the chest and stomach	W	F→F—	At	
X	1″	[This is a hard one]				
	45″	Cannot find anything in it [Limit crab]	Rej +			
9 56		There is a wishbone in the centre	D	F	At	

At interview on November 13th, 1948, the patient was rather dull and looked quite sick He mentioned an operation performed on him the previous day that he did not experience any pain during the operation ("they froze it"), and that he was still vomiting everything he swallowed He volunteered the following *dreams* A recent one was concerned with a
[...]
He had a handbag in each hand The patient empha
[...]   ue")
[...]   Thes
burned for miles straight down to the railroad Many animals ,o- -   One
little cub bear escaped and got underneith the barn I told Dad, he got a gun and shot it I didn't want him to kill it When I woke up I was scared "

On approaching him once more during the same day, he was much more trusting than during the beginning of the first interview Regarding his reaction to the injury and to those around him, he denied that he was ever teased by anyone In the beginning none of the patients knew the nature of his injury "The nurses, of course, know, and some of the patients know also", but he had never had any ideas that they made fun of him He once

felt rather bashful in the presence of women internes when his lesion was exposed. He denied having any plans for the future.

Summary: The Rorschach test was highly abnormal. It showed 7 out of 9 so-called neurotic signs of Harrower. Contrary to the patient's verbal statements during the interviews, there were indications of profound psychological trauma associated with sex.

There was a history of enuresis up to the age of 12, fear of the darkness persisting until the age of 15, and numerous day fantasies associated with violence, inflicting as well as sustaining violence. In this connection it is interesting to note the description he gave of the marital history of his parents, of his father's personality ("he is afraid of shooting"), of the scene of violence with his brother and his own fear of hitting anyone since then. It is also noteworthy that the first dream he reported was one of incestuous relationship with two of his sisters and incest-wish with his mother, and the principle childhood dream he remembered was a nightmare in which he apparently identified himself with the little bear-cub which his father shot.

Impression: This boy has been a psychoneurotic before his injury happened. His day fantasies preceding the injury, his childhood dreams and his psychoneurotic background in general fit in remarkably with what has been described in accident-prone individuals. From this point of view I feel it is not a coincidence that the boy has had three accidents within two years.

The most remarkable feature at present is the tendency to minimize his present injury, *to gloss over the whole situation and to repress the profound psychological trauma in its* entire impact. From this boy's history, his injury must have tremendous symbolic connotations, but it is also no coincidence that he attempts to be so glib about it. His highly abnormal Rorschach findings are a mixture of the pre-existing psychoneurotic traits, and the emotional impact of his trauma.

In view of his tendency to be so glib and casual about his injury it is, in his case, vitally important to let him come to an adequate emotional reaction, otherwise his present trauma would greatly contribute to a vast expansion of his pre-existing psychoneurosis and definitely lead to a serious future breakdown.

CONCLUSION

Injuries resulting in the loss of the skin of the penis are most satisfactorily replaced by skin grafts of about 0.016 to 0.018 of an inch in thickness. Fragments of the scrotum, if carefully preserved, will stretch and form the most physiologically suitable covering for the testicles. When the scrotum has been completely avulsed, the testes may be buried in pockets in the thigh or in a reconstructed scrotal sac, depending upon the age of the patient and his personal and psychological reaction to the deformity. Psychological and endocrinological evaluations at intervals are of value, both from a diagnostic as well as therapeutic standpoint. When indicated, on the basis of these examinations, testosterone may be conveniently administered by subcutaneous injection of pellets of the hormone through a hollow trochar.

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GIBL   ' D '   S rot m n l Perineum together with one Testicle

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NASOPHARYNGEAL STENOSIS: CORRECTION BY TRANSPOSED FLAPS*

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Stenosis of the nasopharynx may follow erosion from strong chemicals, as well as ulcerations due to diphtheria, tuberculosis and syphilis, although these diseases are now minor factors because of more effective modern therapy. Cases seen by the writer have, in general, followed operations for adenoids and tonsils, and are caused by traumatic injury of the upper surface of the soft palate, and the opposing surface of the pharyngeal wall. The surgeon with operative experience in this field is likely to encounter a larger percentage of palate insufficiency rather than stenosis, also the result of surgical traumatic injury. Considering the large number of operations for adenoids and tonsils, however, it may be said that complications are relatively rare.

Nasopharyngeal atresia (better classified as stenosis, as a small opening usually persists behind the uvula) was considered in greater detail in a previous paper in 1946. It is the purpose of this discussion to supplement the observations made at that time, and to present an improved procedure.

The first case reported then was a girl, six years of age, for whom no previous attempt had been made to correct the stenosis. At operation, the soft palate was separated from the pharyngeal wall, and a silver diaphragm was interposed, and held in place by wires. These wires emerged through the nostrils, and were tied down against the columella. The silver diaphragm was removed at the end of four weeks. The opening contracted somewhat, but there was sufficient space for nasal breathing, and no further treatment was necessary.

The second case, a boy of five, was treated in the same manner, but, owing to previous operative failures, more scar was present, and the opening contracted rapidly. The mother was supplied with a tight fitting cone-shaped dilator which she passed through the opening once a day. As the scar stretched and softened, a larger sized dilator was used until the nasopharyngeal opening had no further tendency to contract.

The third case, a woman of sixty-eight years, was treated by skin grafting the external angles between the soft palate and the pharyngeal wall. After separation and excision of the scar, the two grafts were wrapped around small lengths of rubber tubing, and were firmly sutured to the raw surfaces of the lateral walls on each side. The tubes were removed at the end of two weeks, leaving an epithelialized surface on each side. The patient used a snug fitting dilator every day for several months until the scar had stretched and softened. The dilator in this case was also replaced by a larger one at the end of four weeks of use.

In a paper on this subject, Figi has well stated that the "use of skin grafts to reline body cavities has demonstrated the necessity of maintaining dilation

for some weeks or months after operation because of the tendency of these grafts to shrink." We also know that raw areas, covered by flaps, contract less than when covered by free skin grafts.

The important operative requirement in nasopharyngeal stenosis is to eliminate the raw surfaces on the soft palate and pharyngeal wall, and by so doing to minimize the tendency to concentric contraction. In a later case, we attempted to simplify the procedure by covering the contacting raw areas on each side with sliding flaps.

Case 1.—The patient, a woman of forty-five years. Previous history: Tonsils and adenoids were removed in 1939 in an attempt to improve her impaired hearing. Postoperative hemorrhage occurred and was controlled by pharyngeal pack-
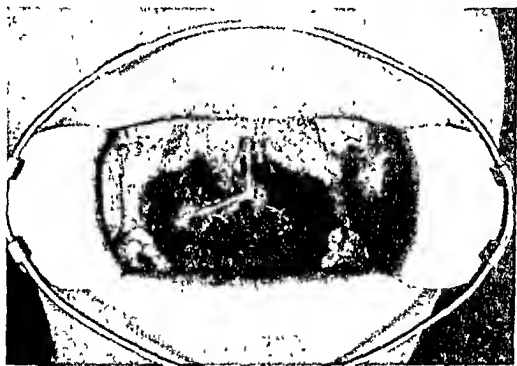
Fig. 1. The adherent scarred soft palate which shows loss of tissue to left of uvula

ing, but was later followed by difficulty in swallowing, and inability to breathe through the nose. These symptoms continued for four weeks. The patient was then readmitted to the hospital for relief by operation, and was discharged somewhat improved.

This case was first seen by the writer in April, 1948. Her symptoms were inability to breathe through the nose, impaired hearing, difficulty in swallowing, and an irritating cough when lying down which kept her awake part of the night. Examination showed a heavily scarred posterior pharyngeal wall (fig. 1) with lack of mobility when gagging. There was an opening behind the uvula large enough to admit a small catheter.

The patient was admitted to the hospital on June 17th, 1948. Under general anesthesia, a stiff, nearly right-angled probe was passed through the opening behind the uvula into the nasopharynx. The upper limit of the palatopharyngeal attachment was then determined by palpation. From the upper limit of the

scar attachment, a vertical incision, 2.5 cm. in length, was made on each side of the uvula. Horizontal incisions of about 2.5 cm. were extended laterally from each end of the vertical incisions. Another horizontal incision of the same length was made on each side about 6 mm. below the upper incision, forming an
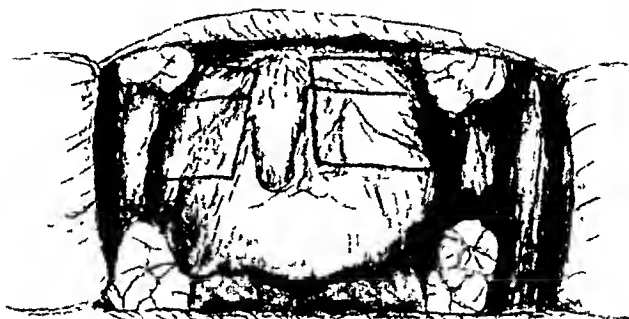
FIG. 2. INDICATES INCISIONS FOR CORRECTION OF THE STENOSIS
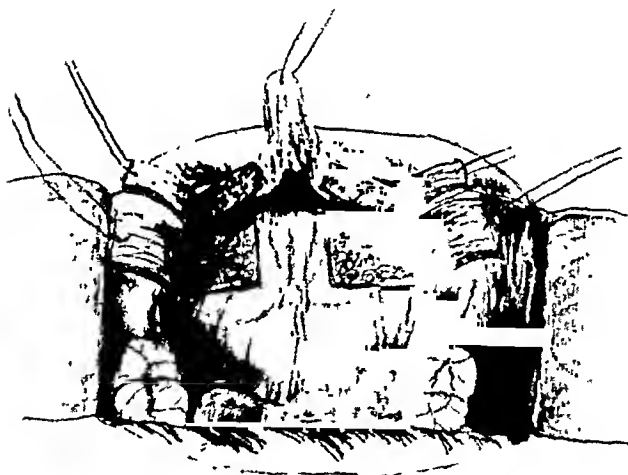
FIG. 3. The flaps are shown elevated and retracted externally, and held by sutures through the inner margins. The uvula is also drawn forward.

E on one side, and a reversed E on the other (fig. 2). The incisions passed through the mucosa and muscle to the prevertebral fascia. The four flaps were elevated, and sutures were passed through their inner margins so they could be retracted externally (fig. 3). The flaps were somewhat thinned by removal of scar. The
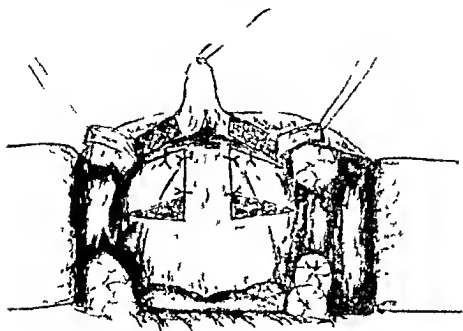
Fig 4 Excess of scar has been removed. The lower flaps have been raised and sutured cover the raw surface under the soft palate
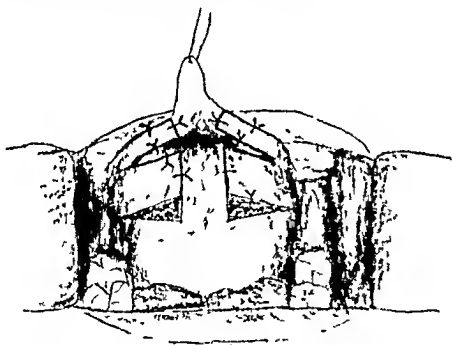
Fig 5 The upper flaps have been rotated and sutured to the posterior border of the soft palate

soft palate was drawn forward to expose the operative field by means of a suture through the tip of the uvula. The lower flap was then rotated upward to over the raw surface on the pharyngeal wall posterior to the palate, and was sutured with fine silk. The raw surface along the lower border of the flap was left to granulate, as it was out of contact with the palate (fig 4)

The upper narrow flaps on each side were sutured to the raw surface along the posterior border of the mobilized soft palate. It will be seen that the denuded
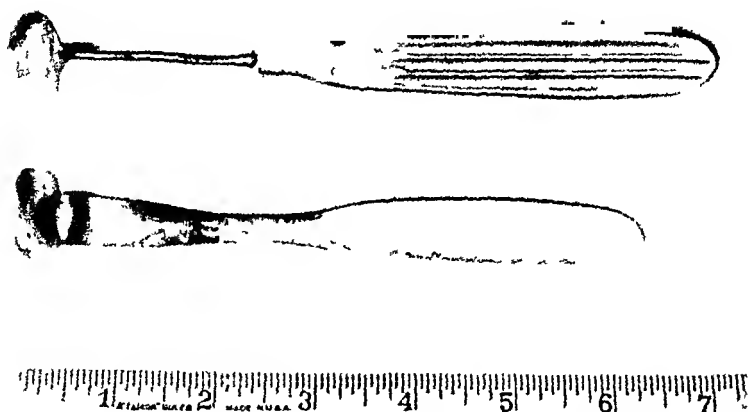
FIG. 6. Shows dilators (about three-quarters natural size) for patient's use to maintain the nasopharyngeal opening until the scar has softened
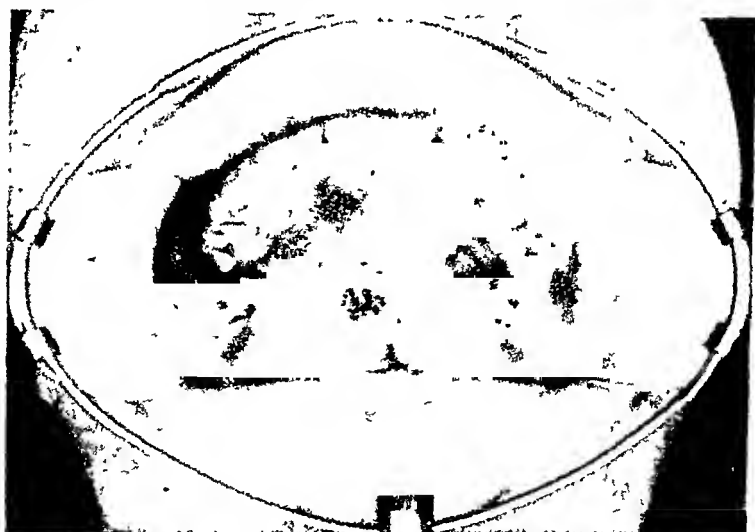
FIG. 7. Shows the Palate Several Months Later

surfaces on the pharynx and palate that contacted each other were completely covered (fig. 5). Sutures were removed on the eighth day.

To avoid concentric contraction, a dilator the size of the opening (fig. 6), and well lubricated with vaseline, was passed behind the palate by the patient every

day, beginning at the end of the second week, and continued for several weeks. The cough soon disappeared, and, from the time of operation, the patient was able to breathe freely through her nose. A photograph was made of the pharynx several months later (fig. 7).

SUMMARY

A brief reference to three previously reported cases of nasopharyngeal stenosis, together with the addition of another case in which the technique is modified and improved.

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CANCER OF THE FACE: TREATMENT AND PLASTIC REPAIR*

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Patients with cancer of the face do not receive as efficient treatment as one would expect from the site of the lesions and the facility with which a diagnosis can be made. When a diagnosis can be definitely established by microscopic examination of either a fresh frozen section or a fixed section, it is difficult to understand why so many lesions about the face are treated in a conservative way. In cases in which this type of treatment is employed, the growth frequently recurs and becomes fixed to cartilage or bone, or metastasizes to the neck. These complications make the necessary treatment much more radical, produce postoperative defects, and make the outlook for controlling the growth very questionable. Although biopsy should be performed before treatment is instituted in cases in which the diagnosis is questionable, it is much better to remove the entire growth, if possible, and to examine a fresh frozen section to corroborate the clinical diagnosis. I do not think that a specimen for biopsy should be removed by a physician who is not prepared to treat the tumor in a radical way if it proves to be malignant. The chance for permanent cure will be much better if the surgeon who is to do the operation can examine the patient before a specimen for biopsy is removed so he is able to determine the apparent extent of the tumor and also to select the site from which the specimen should be removed. At times, the trauma resulting from the removal of the specimen makes it impossible to determine how much of the enlargement is the result of the tumor and how much is the result of reaction from the trauma caused by removal of the specimen. This makes it difficult for the surgeon to decide how widely to remove the tumor beyond the apparent margin. Sometimes, in removing the specimen for biopsy, the incision is placed so that it interferes with a pedicle flap or a rotation flap that might be employed in a reparative procedure. In other words, if a plastic operation ultimately will be required, the plastic surgeon should be consulted regarding the tumor before its removal, or, better still, he should be allowed to remove the lesion. Cancer about the skin of the face may be a basal-cell epithelioma, or both a basal-cell and a squamous-cell carcinoma. Although the grade of malignancy of a squamous-cell epithelioma usually is low, it occasionally may be high. At times, one sees a squamous-cell epithelioma that simulates a sarcoma and grows very rapidly. This type of tumor usually occurs in actinodermatitis which follows irradiation. While the microscopic appearance indicates that this type of tumor is very malignant, I have never seen a case in which the patient did not stay well after wide removal of the tumor with surgical diathermy. This tumor rarely metastasizes. Adenocarcinomas of the mixed tumor type or of the cylindroma type may occur in the parotid region.

In the surgical management of malignant tumors of the face, either sharp dis section or electrocoagulation (surgical diathermy) may be employed When using these two methods of treatment, cancer of the face may be divided into four groups (1) lesions which permit of sharp excision and which, after excision, leave wounds that can be closed immediately by simple approximation of their edges, (2) lesions which permit of sharp excision and which, after excision, leave wounds that require the use of a skin graft for repair, (3) lesions which should

Fig 1
eyelids
surgical
after six years

be removed by surgical diathermy and which, after electrocoagulation leave small wounds that heal spontaneously by granulation and epithelization (fig 1) and (4) lesions which should be removed by surgical diathermy and which, after electrocoagulation, leave extensive facial defects that require some form of plastic repair (fig 2) Figures 1 through 11 illustrate the treatment and plastic repair of cancer of the face

The first group includes small basal cell and low grade squamous cell epithe liomas of the face which have not been treated previously and which are so situated that primary closure of the wound is possible after wide removal of the growths (figs 8 and 9) For instance, many small lesions situated about the forehead, eyelids, lips and cheeks can be treated in this manner Also included in this group of tumors are freely movable adenociremomas of mixed tumor type in the parotid region

FIG. 2a. Postirradiated basal-cell epithelioma of the entire lower eyelid, outer third of the left upper eyelid and inner canthus, with an area of involvement below the eyelid on the left cheek. The lesion was removed by surgical diathermy. b. Postoperative appearance eleven months later. c. Appearance nineteen months later. An advancement flap was made from the left cheek, and then a skin graft was used to correct the deformity.

The second group of tumors includes basal-cell and squamous-cell epitheliomas which are large, which have not been treated previously, and which are superficial and freely movable; after removal, however, the resultant wound is too

large to permit approximation of the skin edges and, consequently, must be covered with a skin graft (figs 5 and 6) Either a free full thickness or shaved skin graft is employed for this purpose, usually, I prefer a full thickness dissected graft If the denuded surface is not too large, a full thickness skin graft obtained from behind the ear or from the mastoid region is preferable because

Fig 3a

o tube flaps were
f Postoperative

its color and texture are very nearly the same as those of the skin of the face In larger areas a full thickness skin graft from the supraclavicular region is to be recommended In some instances, a more satisfactory repair can be accomplished by means of a small pedicle flap of skin which is advanced over the defect from the adjacent tissues (figs 4 and 11)

The third group of tumors includes small malignant lesions which are of a high grade of malignancy or which recur after previous treatment, particularly in radiation therapy

FIG. 4a. Actinodermatitis (precancerous) of the nose. The affected tissue was removed and a forehead flap was brought down to replace the defect. b. Postoperative appearance.
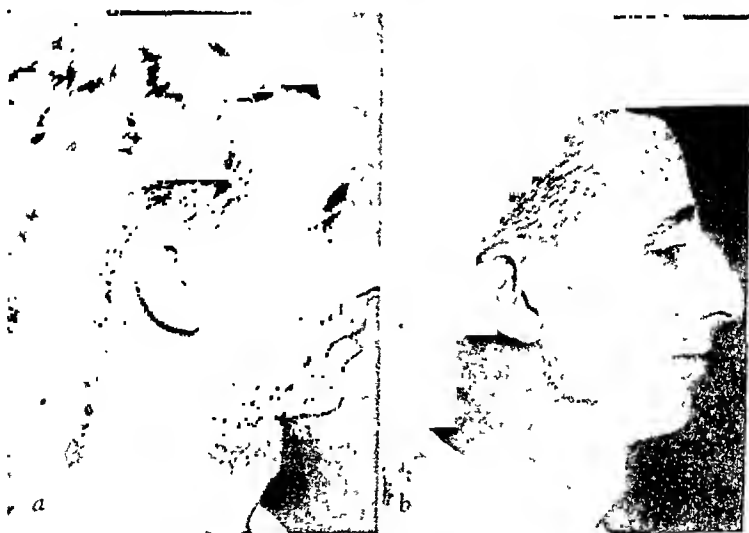
FIG. 5a. Actinodermatitis (precancerous) of the right cheek and neck. The affected tissue was excised and replaced with a full-thickness skin graft. b. Postoperative appearance. Partial excision and advancement flaps would reduce the size of the graft.

The fourth group of tumors includes very extensive malignant lesions of the face which have been treated previously. The most serious members of this group are those skin cancers which recur after previous irradiation therapy

and which are fixed to underlying cartilage or bone about the orbits, jaws, cheeks, ears or nose (fig. 7). Under these circumstances, the growth has infil-

Fig. 6a. Bilateral actinodermatitis of both cheeks, upper lip and chin, with multiple areas of epithelioma which were removed and replaced with skin grafts. While a delayed or tubed flap might have been employed in this case, the character of the skin and the subcutaneous tissue would not permit this b Postoperative appearance

Fig. 7a.
and nose.
c. One yea.

trated the soft tissues down to the periosteum or perichondrium and may actually be invading the bone or cartilage Postoperative fixed adenocarcinoma of the parotid region is also in this group. I believe that the treatment of choice in such cases is wide removal with surgical diathermy and thorough electrocoagulation

FIG. 8a. Postirradiated squamous-cell epithelioma, grade 2, of half of the left lower lip. b. The epithelioma was excised and a plastic operation was done at the left angle of the mouth. This was followed by a dissection of the submental and submaxillary glands.

FIG. 9a. Epithelioma of the entire lower lip. The patient had had an epithelioma removed from the right cheek and lower lip several years previously. A bilateral dissection of the submental and submaxillary glands was done here. b. Postoperative appearance. The growth was excised and a plastic operation was done at either angle of the mouth and upper lip. The stitches have just been removed.

of the involved perichondrium or periosteum far beyond the apparent limits of the growth.

Fig. 10a. Postoperative and postirradiation defect associated with squamous-cell epithelioma, grade 2, of the right lower lip and jaw. A large sequestrum that extended from the midline to the region of the last molar tooth was removed from the right side of the lower jaw. An Eslander type of operation was done to fill in the postoperative defect. b. Postoperative appearance seven months later. The stitches have just been removed. A secondary operation was done to enlarge the angle of the mouth on the right side
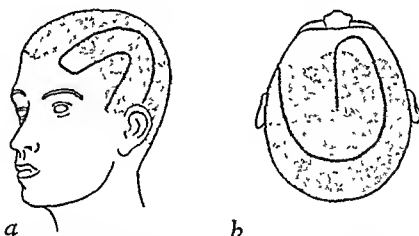
Fig. 11a and b. Lateral and midline sickle flaps used in repairing postoperative defects about the face after removal of carcinoma

In cases in which a carcinoma recurs after irradiation and involves cartilage or bone, the tumor may be found by microscopic examination of fresh frozen sections of tissue far beyond the apparent limits of the growth; therefore, if tissue about the growth appears to be involved, specimens should be removed and examined in the course of the operation.

This method of having an examination made, during operation, of fresh frozen sections of questionable tissue about the growth has been used at the clinic for many years and has given the most satisfactory results in cases in which recurring malignant growths involve bone or cartilage. In these cases, a sequestrum usually occurs and has to be removed in two months after the operation, when it can be separated from the normal bone. The removal of growths about the face sometimes leaves large openings in the frontal sinus, ethmoid cells, maxillary sinus, nose, lips and cheeks (fig. 10). In cases in which the tumor is active, it is best not to attempt reconstruction until at least a year from the time of the removal, in order to be fairly certain that recurrence does not take place. If a flap or a free graft is used to close a defect shortly after operation, particularly in cases in which the tumor is active or has recurred after irradia- tion, and if some thickening of the graft occurs, it is difficult to determine whether or not the tumor has recurred. The tumor sometimes recurs underneath the graft or flap before the patient or the surgeon is aware of it. It is advisable to make fairly sure the patient is well before the defect is repaired. If this is done one can be reasonably certain that there will not be recurrence.

If the bone of the forehead, skull, or malar region has been destroyed it may be possible to chisel away the sequestrum and allow granulation tissue to come up through the normal bone and then apply a split-skin graft. In cases in which the defect is large, various types of pedicle flaps can be employed. The common ones for the smaller defects are the lateral and midline sickle flaps. For the larger defects, submaxillary, supraclavicular or subaxillary abdominal flaps may be employed (fig. 3).

Complete primary removal of carcinoma of the face is essential. Examina- tion of fresh frozen sections of tissue at the time of the operation aids in deter- mining the best treatment. In cases in which the tumor recurs and becomes fixed after irradiation, examination of fresh frozen sections is an aid in deter- mining the limits of the growth. Bilateral dissection of the submental and sub- maxillary glands should be done in cases of squamous-cell epithelioma, grade 2, 3 or 4, of the lower lip or cheek. The time of repair of the postoperative defects should depend on the nature of the growth and on the previous treatment. Irradi- ation, if used at all, should be a secondary procedure.

THE USE OF REMOVABLE ACRYLIC PROTHESIS TO RETAIN MANDIBULAR FRAGMENTS AND ADJACENT SOFT TISSUES IN NORMAL POSITION AFTER SURGICAL RESECTION

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It is not always possible to replace a removed segment of mandible with bone at the time of operation The mandible is resected for a number of conditions, certain types of chronic osteomyelitis, benign tumors, malignant tumors, and rare diseases With osteomyelitis there is always a large amount of infection preventing immediate bone grafting Resection for benign tumor may at times permit transplantation of bone, particularly if the operation is carried out through a skin incision, and provided the mucous membrane of the mouth is not opened, leaving a sterile bed for the graft On the other hand, frequently a large benign tumor is so adherent to, or has stretched the mucous membrane so thin, that accurate closure is impossible, whether the excision of the mandible has been by extra- or intraoral approach The latter approach does not allow a sterile bed for the graft It is true that with modern antibiotic therapy there is less likelihood of infection of a bone graft, even if the mucous membrane is open

When the mandible is resected for malignant disease immediate bone grafting is rarely advisable, it being wiser to allow six months or a year to elapse for reasonable assurance against recurrence

Then, too, resection for malignancy requires the inclusion of a considerable amount of soft tissue to allow a safe margin, resulting in so large a deformity that immediate bone graft is impossible Occasionally, immediate soft tissue graft is done, the bone being put in at a later operation

Removal of a portion of the mandible allows shifting of the remaining fragment or fragments in the direction of muscle pull Postoperative scar tissue, particularly dense if infection has occurred, also aids in the displacement Notable in this connection is the dense scar tissue following heavy radiation, always accompanied by a certain amount of infection, especially about the mouth Any mechanism that will maintain the mandibular fragment or fragments in normal position prevents or limits deformities frequently difficult to correct at a later time

The object of this paper is to report a method of using an acrylic prosthesis in the raw area left by intraoral resection of a large portion of the symphyseal region of the mandible, together with part of each ramus and attached mucous membrane. No attempt was made to bury the prosthesis in the tissue The pros-

thesis held the stumps of the rami and adjacent soft parts in normal position while the mucous membrane grew beneath the prosthesis re-forming the floor of the mouth. Without the prosthesis, the soft parts and bone fragments would have fallen together, causing much deformity and contraction of the chin. The prosthesis was made the exact size and shape of the normal mandible and held in place by means of clasps gripping the last lower molar tooth on each side. The patient had a very large adamantinoma of the solid type, requiring resection as far back on each side of the mandible as the second molar. The second molar was removed and the resection line made through the socket on each side.

The operation was carried out entirely in the mouth without scarring the chin. The prosthesis was inserted into the raw area left by the extensive loss of mucous membrane; the mucous membrane was very much thinned out over the tumor and so adherent that it could not be saved. The prosthesis was allowed to remain in place about six months. When it was removed the floor of the mouth was normal and soft and pliable. The patient has now gone about three years without recurrence and is ready for bone grafting.

CASE PRESENTATION

T. B., colored female, aged 26. First admission to the University Hospital, Baltimore, March 18, 1944, with the diagnosis of mandibular adamantinoma and rheumatic cardiovascular disease. She was kept in the hospital until April 18, 1944, for study and observation. A complete review by the medical service made surgery with a long anesthetic unwise at this time. She was discharged and followed in the Outpatient Departments of Medicine and Oncology.

Second admission (1946) after medical examination had indicated that her condition was satisfactory for anesthesia.

The history of jaw tumor dates back three and a half years, at which time she consulted a dentist because her teeth did not seem right. She was referred to a physician for opinion, but no diagnosis was made. Her teeth were extracted with subsequent healing, but the jaw enlargement continued and she was sent to the Oncology Dispensary.

At the time of her second admission, there was a hard mass arising from the site of the left lower incisor and bicuspid teeth, which extended across the symphysis into the right anterior mandible (Fig. I, A and B). The mucosa covering the central portion of the mandible is bluish, cystic, and crackles on pressure; a sign frequently present in adamantinoa.

Routine serological, and chemical tests of the blood, together with several urinalyses, were normal. After adequate survey and preparation preoperatively, the mandible was resected through the mouth from just anterior to the third molar on one side to just anterior to the third molar on the other. Anesthesia consisted of a combination of sodium pentothal by vein and nitrous-oxide and ether by intratracheal tube. The previously prepared prosthesis (see below) was inserted in the mouth in the raw bed caused by the excision of the huge mandible. A large amount of mucous membrane was lost because of its thinness and adherence to the tumor, leaving a defect about $1\frac{1}{2}$ cm. in width and 7 cm. in length. The prosthesis fitted down in this raw bed, abutting against the stumps of the rami and maintaining the soft parts of the chin and lower face in normal position.

The convalescence was uneventful. The patient wore the appliance constantly, was ambulatory post-anesthesia, and promptly took liquid diet. In six days, she was on soft diet and in twelve days postoperative was discharged with a full lower denture in place; that is, the prosthesis carried a set of artificial teeth. As indicated in Fig. IV, one could not tell that her mandible had been resected by simply looking at her with her mouth opened

molars
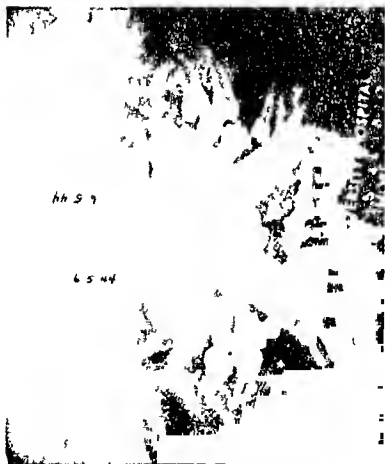
or closed. A careful examination was required to note that the prosthesis replaced the lower jaw.

Pathological report was cystic adamantinoma of the mandible. A stroma of dense fibrous tissue is present, containing many cystic spaces lined by one or more layers of tall cuboidal epithelial cells. The central portion of some of these cystic spaces is filled by stellate cells joined to each other by fibrillary processes.

A. A-P view.

B. Lateral views.

Fig. II. A. Artificial stone casts of upper and lower jaws
B. Cast of lower jaw. Black lines in A and B outline area to be resected. These casts were made in 1944. Resection delayed until 1946 on account of patient's cardiac status. Resection then passed through 2d molar sockets.
C. Cast resected.
D. Prosthesis of 1944 in place on cast.

Footnote—At thet ime of the operation herein reported we were unaware that V. H. Kazanjian had used a similar technique reported in 1932, 1934, and 1939. Since submitting this article for publication we have corresponded with Dr. Kazanjian. The references to his articles follow:
Kazanjian, V. H.: Prosthesis of the Mouth and Face, No I. Modern Accomplishments in Dental and Facial Prostheses. Jour. Dental Research, Vol. 12, 1932.
Idem: Dental Prostheses in Relation to Facial Reparative Surgery. S., G , and O., Vol. 59, 1934.
Idem: Jaw Reconstruction. Amer. Jour. Surg., Vol. 43, 1939.

TECHNIQUE OF CONSTRUCTION OF PROSTHESIS

The prosthesis used in this case was first constructed on the basis of measurements made before the first admission in 1943. Because of the medical con-

traindication to operation, the patient was discharged from the hospital and re-admitted in 1946. The adamantinoma had grown slowly during that period; consequently, the prothesis had to be modified and enlarged, as it was necessary to resect more of the mandible than would have been necessary in 1943. (See Fig. II, A to D; and Fig. III, A and B.)

Accurate impressions of the maxillary and mandibular dentitions, using an elastic alginate impression material, were made. From these impressions,

Fig. III. Prosthesis made in 1946 and used in patient. Note clasps for lower 3d molar teeth only, in contrast to prosthesis made in 1944 which had clasps for 2d and 3d molar teeth on each side.

hydrocal (or artificial stone) casts were constructed. These two casts were articulated and mounted upon plaster bases and pedestals in such a manner that they could be easily removed or replaced on their mountings (Fig. II, A)

Anticipating the extent of the proposed resection, the mandibular cast was cut following the outline given by the surgeon. (Fig. II, B and C) The cast was then duplicated in a refractory casting investment, and a gold alloy stent made, utilizing the patient's remaining teeth for the reception of the metals clasps to aid in retaining the appliance in the mouth (Fig. II, D). Because of the con-

Fig. IV. Patient several months after operation. Prosthesis in place; occlusion and mastication excellent.

Fig. V. Roentgenogram with prosthesis in place. Metallic stent, clasps, and crowns visible. Acrylic portion does not cast a shadow on film. Note excellent position of mandibular fragments.

tinued growth of the tumor for the three years, it was possible only to retain the third molar on each lower jaw (Fig. III, A and B). With the use of routine dental techniques, artificial teeth and the anterior section of the body of the mandible were attached to the gold alloy stent. These structures were composed of the plastic, polymethyl methacrylate, which is usually well tolerated by the soft tissues of the oral cavity (Figs II, D; and III, A and B). The exact size and form of this artificial segment of the mandible were established by measurements of the patient's head and jaw, and an approximation of the appearance of the jaw, had it not been pathological.

Upon the completion of this appliance, it was proposed that the prosthesis would be inserted in the operating room immediately following the surgical

Fig. VI Photograph . .
gold crowns on each low : . .
spite of temporary absei _ _ : . _ _ _ _ _
fragments.

resection. Patient would leave the operating room with the remaining segments of the mandible in normal, functioning position, without any interference with esthetic appearance. (Fig. IV, taken after patient was ambulatory.)

As has been stated, only the two lower third molars, one on each side, were retained to aid in holding the appliance. Since these two teeth were but partially erupted, they presented unfavorable abutments for the reception of the circumferential clasps. A cast gold alloy crown was therefore constructed for each of these molars, the purpose of the crown being to establish parallel walls and necessary undercuts to successfully receive the cast gold alloy clasps. The crowns were placed on the teeth and an alginate impression taken of the mandibular dentitions. The crowns were removed from the teeth, inserted in their proper places in the impression, and a stone cast made with the crowns of the casts in the exact places that they would occupy in the mouth.

The necessity of using the third molars only, and third molars that had to be crowned, presented the disadvantages of much less rigidity and masticatory

functions of the prosthesis, and a less favorable prognosis as to the duration of the usefulness of the appliance. Third molars as a class are weakly supported teeth, therefore, they are more likely to become luxated under excessive stresses. Certainly, the supporting and retaining of an appliance of this nature would be considered a source of very excessive stress; however, the prosthesis was inserted immediately following the surgical treatment, and to this date it has been working successfully. (Figs. IV, V and VI.)

UTILIZATION OF THE TUBE PEDICLE IN THE RECONSTRUCTION OF FACIAL DEFECTS*

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The use of the tube pedicle in facial reconstruction is usually reserved for those cases lacking sufficient adjacent material for repair by other means The superiority of fractional excision and Z-Plasty has been demonstrated in many instances and the limitations of such methods will vary with the experiences of the individual surgeon Certain cases may therefore be considered on the borderline and might possibly be handled either way, other cases, with which this paper is primarily concerned, necessarily require the use of the pedicle flap

Where there is a choice in the selection of a donor site for a flap destined for the face, the neck has much in its favor The color and texture of the skin is a satisfactory match, and the donor scar may be effectively concealed In addition to these well known characteristics, the exceptional circulation in this area is especially valuable for the purpose The diameter length ratio may be extended to one to four or even slightly greater, thus allowing for transfer to the face in one jump It is also feasible to transfer relatively large size flaps through the medium of such pedicles

All flaps here presented were routinely delayed primarily and secondarily, and in the case of exceptionally large flaps, a tertiary delay was performed The various stages were spaced approximately three weeks apart, the adequacy of the circulation having been previously tested by the tourniquet method The only complication relative to the circulation noted after transfer was a transitory edema of the flap and pedicle in two cases where the pedicle was exceptionally long for its diameter Gentle massage was instituted and in both cases the edema subsided within 48 hours

In the following cases the neck pedicle has been used whenever possible, in certain instances the acromiopectoral region and even the abdominal region has been called upon One or two cases may be considered of the borderline type, and might have been corrected by other methods

Case I (U S Veterans Hospital, Fort Miley, San Francisco) A 56 year old man was admitted to this hospital during 1947 with a defect of the right ala In 1944 a malignant lesion in this area was treated by X ray Approximately one year later the ala underwent a sloughing process resulting in the present deformity A biopsy at this time revealed a squamous cell carcinoma about the margins of the defect A radical excision was performed and in 1948 a series of reconstructive operations were done utilizing a neck tube pedicle as shown in the accompanying photographs

Case II. (U. S. Veterans Hospital, Fort Miley, San Francisco) A 31 year old white male was admitted to the hospital in January 1948 for the purpose of alar reconstruction. The left ala had been excised in 1945 at Dibble Army Hospital following diagnosis of a squamous cell carcinoma. In January 1947, in a civilian hospital in Utah, an abdominal operation had been performed with removal of a "tumor". This was later determined to have been an adeno-carcinoma of the colon, which was resected. The record of this hospitalization was not available to us until several months later, at which time the reconstruction was well in progress. However, prior to surgery, a complete workup including Roentgen studies was negative for pathology. The plastic work was completed in the summer of 1948. Eight months later the patient was re-admitted complaining of symptoms suggestive of a duodenal ulcer. He eventually came to a laparotomy and a diagnosis of metastatic carcinoma involving the retroperitoneal lymph nodes was established. A posterior gastroenterostomy was performed as a palliative procedure. This patient's familial history is worthy of note: Mother died at age 54 of carcinoma of the stomach as did a brother at the age of 32. One sister has carcinoma of the stomach at this time. This somewhat fruitless reconstruction was also accomplished with the use of a neck tube.

Case III. (U. S. Naval Hospital, Oakland, California) A 20 year old Marine was admitted in June 1945 with third degree burns involving scattered areas on the right side of the face, producing an ectropion of the right lower lid and upper lip. Thin split grafts were used to obtain healing of the area. Due to scattered scarring about the face, fractional excision or Z-Plasty were not considered to be practicable. It was therefore decided to used a neck tube pedicle and flap to replace the skin loss. Additional work on the ala was subsequently done at another service hospital.

Case IV. (U. S. Naval Hospital, Oakland, California) A 19 year old Marine was admitted in February 1946, with a diagnosis of shrapnel wounds of the face. He had previously been undergoing treatment at the Mare Island Naval Hospital on the service of Dr. Gerald Brown O'Connor. At the time of entrance to this activity the work had progressed as shown in Fig. IV. In this instance, due to the large amount of tissue required, an abdominal pedicle had been elected, which was transferred to the face by means of an amputation stump of the forearm. The completed nose and lip eventually blended in quite well with the surrounding facial skin, especially after exposure to the sun.

Case V. (St. Mary's Hospital, San Francisco, California) A 52 year old white male was admitted to this hospital in December 1947 for the purpose of reconstruction of the jaw. According to the history, in 1943 he was treated for a fungating carcinoma involving the lower lip and chin. Large doses of Xray were used, the exact dosage not determined. Improvement was noted as shown in Case V, Figs. I and II. About eight months later a sloughing process developed for which the patient did not consult a doctor. Eventually the entire chin sloughed, and with it almost all of the mandible except for two small stumps of the rami. In 1946, in order to furnish a temporary floor of the mouth to control the tongue and to lessen drooling, a tube pedicle was migrated from the abdomen and eventually positioned as shown in Fig. III. This work was done at Stanford University Hospital, and the tissue not only served the purpose for which it was intended, but also furnished needed material as an oral lining in the later reconstruction.

Reconstruction was proceeded with at St. Mary's Hospital as shown in the accompanying photographs. The most critical stage in this work consisted in the insertion of a large bone graft following complexion of the soft tissue stages. Since this graft required a near total replacement of the mandible, various methods were duly considered and finally a choice made in favor of rib. Eight inches of the seventh rib was required. This graft was suitably curved by removal of closely spaced vertical segments from its internal or concave surface. Barely sufficient ramus stumps were available for wire fixation. Bone chips were packed about the sites of union. External pressure by means of elastoplast and ace bandage was the only postoperative fixation employed. Fortunately, union was prompt and uncomplicated, and there has been so shifting or change in position of the graft since its insertion *six* months ago.

SUMMARY

1. Utilization of the tube pedicle in facial reconstruction is reserved for those cases lacking sufficient neighboring material for repair by other means

2. Five cases of facial deformities are presented in which tube pedicles were used

3. The use of a large rib graft is illustrated in a near total reconstruction of the jaw.

CASE I—FIG. I Loss of ala and columella resulting from excision of malignant lesion.

CASE I—FIG. II. Utilization of a neck tube pedicle measuring 11 inches by 2½ inches which is of sufficient length to dispense with a restraining cast The lining was furnished by a reflected flap from the margin.

CASE I—FIG. III. Photograph taken three weeks after division of pedicle and formation of ala and columella. A defatting procedure may be indicated at a later date.

CASE II—FIG. I. Loss of ala following excision of squamous cell carcinoma two years previously. The neck tube was constructed in two stages, leaving a central bridge.

CASE II—FIG. II This pedicle is 12 inches in length, including the flap, and 2½ inches in width The lining was formed by a marginal flap previously delayed

CASE II—FIG. III. Photograph taken approximately six weeks following division of the pedicle. Proximal portion of the pedicle is allowed to remain until reconstruction is completed.

Case III—Fig I A third degree burn of the face has been temporarily covered with a split graft preparatory to definitive treatment Because of scarring of adjacent areas, and a large amount of skin loss, fractional excision was not considered to be indicated

Case III—Fig II Illustrating the position and relative size of a neck flap designed for transfer to the face Primary, secondary and tertiary delays were performed before transfer

CASE III—FIG. III. The flap has been transferred to the face without circulatory embarrassment, despite the relatively narrow pedicle

CASE IV—FIGS I and II Loss of nose and upper lip due to shrapnel Lining flaps have been outlined and delayed, in glabellar region and on cheeks lateral to defect

CASE IV—1 to III Due to large amount of tissue required an abdominal tube pedicle was used in this case transferred to the face by means of forearm stump)

the nose
ern nose

CASE IV—FIGS. V and VI. Pictures taken approximately one month after formation of nose. Later the right side of the lip was raised and defatted, and a mucous membrane flap from the lower lip was transferred to the upper lip furnishing a vermilion border.

CASE V—FIG I. Extensive fungating carcinoma of lip and chin, which received Roentgen therapy in 1943.

CASE V—FIG. II. View of tumor following heavy radiation Several months later a sloughing process developed, involving soft tissues of jaw and the greater portion of the mandible except for short stumps of the rami. (See Fig. VIII)

CASE V—FIG. V. Illustrating the utilization of the mouth flap as an oral lining. After incising along inferior and lateral borders, the skin is reflected inwards Incision into oral cavity superiorly allows the upper lip to return to normal position and furnishes point of attachment for rotated flap.

CASE V—FIG. VI. Acromio-pectoral flap was transferred at same time into area formed by reflection of lining tissue

CASE V—FIG VII Pedicle detached after twenty seven days and remainder of flap fitted into the defect There is ample lining and skin covering for reception of a bone graft

Case V—Figs IX and X. Front and profile views of reconstructed jaw six months after bone grafting There has been no shifting of the graft and union has remained firm. Some action is present from temporal and masseter muscles.

THE USE OF DORSAL SKIN FLAP FOR THE COVERAGE OF PALMAR DEFECTS AFTER APONEURECTOMY FOR DUPUYTREN'S CONTRACTURE*

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Manus Apostolicus, "the hand of the apostle", was the term historically applied to the condition known today as Dupuytren's contracture. This position of the hand, with the index and long fingers extended, but with the ring and little fingers drawn down into the palm, is characteristic of the deformity which was described in 1832 by Baron Dupuytren, chief surgeon to the Hotel Dieu, Paris

The essential pathologic features of this condition are the proliferation and contraction of the palmar aponeurosis. The cause of this condition has been the subject of great speculation. A hereditary tendency probably exists in affected individuals, as indicated by family history. Trauma is generally discounted as the chief cause, although in certain cases chronic trauma may be a contributing factor. Recently, reports have been made of the development of typical contractures following coronary heart disease, the explanation of these cases is obscure

The former method of treatment of this condition was by subcutaneous section of the contracting fascial bands, the method used originally by Dupuytren. With this method, only temporary relief was obtained, recurrence was the rule. It is now quite generally agreed that the successful permanent relief of this disabling condition requires (1) complete removal of the palmar aponeurosis, (2) sound healing of the surgical wound permitting early movement of the hand to avoid joint stiffness. The importance of the above was emphasized by Kanavel, Koch, and Mason in 1929

In advanced cases of Dupuytren's contracture there is often involvement of the palmar skin by the pathologic process, in those areas overlying the thickened fibrous bands there is loss of subcutaneous fat, and the skin itself is attenuated and actually invaded by the fibrous tissue. Such areas of skin are often so thin that they are not viable after removal of the palmar aponeurosis and must be excised to avoid a slough

In addition, there is sometimes an appreciable shrinkage of the palmar skin near the bases of the fourth and fifth fingers incident to the long standing flexed position of the metacarpophalangeal joints. This is forcibly demonstrated when, after exposure and excision of the palmar aponeurosis through a transverse incision along the distal palmar crease, the metacarpophalangeal joints are brought into the fully extended position. We now observe that the narrow crevice created by the incision along the distal palmar crease is transformed

into a crevasse which seems to beg for extra skin coverage. This gap is usually widest near the ulnar border of the hand.

The problem of palmar skin replacement after aponeurectomy is very important, difficult of solution, and no one method is applicable to all cases. Three methods are in general use: the Wolfe graft, the split graft, and the abdominal pedicle.

The free full thickness or Wolfe graft is one method commonly used. Such grafts can be cut to fit any skin defect and they furnish an elastic, though somewhat thin, covering for the palm or fingers. This type of graft requires meticulous technique and thorough splinting for its success. Despite the above, punctate sloughs are not uncommon, probably occasioned by the far from ideal bed into which the graft must be laid. If sloughs occur, low grade infection invades the surgical wound, healing is delayed, and furthur splinting is necessitated. Prolonged splinting, plus infection causes joint stiffness, which is difficult to overcome.

The split thickness graft has the advantage that a higher percentage of complete takes will be obtained, therefore this type of graft may be used in preference to the Wolfe graft if the recipient bed is not ideal. However, the shrinkage that often occurs in this graft may lead to a deficiency of skin in the palm which is undesirable. Neither Wolfe grafts nor split grafts form an ideal covering for the palm because they lack a subcutaneous fat cushion.

The abdominal tube pedicle may have an occasional indication in advanced cases of Dupuytren's contracture with marked involvement of palmar skin. However, such grafts are bulky and are often impractical due to the long period of hospitalization required, and greater discomfort to the patient. Patients with abdominal pedicle skin in the palm are not always happy with these grafts.

The plan of shifting dorsal skin flaps to replace palmar defects after aponeurectomy was employed by Lexer. This technique as illustrated in text books resulted in longitudinal suture lines in the palm. It is essential from the functional as well as the cosmetic standpoint that scars in the palm are not at odds with normal skin folds.

A method of dorsal flap rotation which results in suture lines conforming with existing skin creases has been found useful in cases of Dupuytren's contracture with marked involvement of the fourth and fifth fingers. In such cases, there is often a shrinkage of the palmar skin near the ulnar end of the distal palmar crease. Excision of non-viable skin in this area may further increase the defect which appears at operation when the metacarpophalangeal joints are completely extended.

Access to the palmar aponeurosis for resection is obtained through a transverse incision in the palm along the distal crease; the incision curves proximally at the ulnar border of the hand to intersect the mid-lateral line at an angle of about sixty degrees. A short additional incision is made if necessary along the thenar crease near the base of the palm to expose the proximal portion of the palmar fascia (Fig. 1).

The triangular sheet of fascia comprising the palmar aponeurosis, including its arcades over the flexor tendons and lumbrical structures, is dissected out in

toto Great care must be taken to avoid trauma to digital nerves, otherwise paresthesia or anesthesia will result All ramifications of the diseased fascia in the palm should be completely removed The technique for accomplishing complete removal of the offending fascia is graphically described by Bunnell in his textbook, "Surgery of the Hand"

Exposure of the fibrous digitations in the fingers is made through mid lateral incisions, or through median longitudinal incisions with Z plasty as suggested by McIndoe The displacement of the digital nerves and vessels from their normal anatomical locations as brought out by Mason should be borne in mind
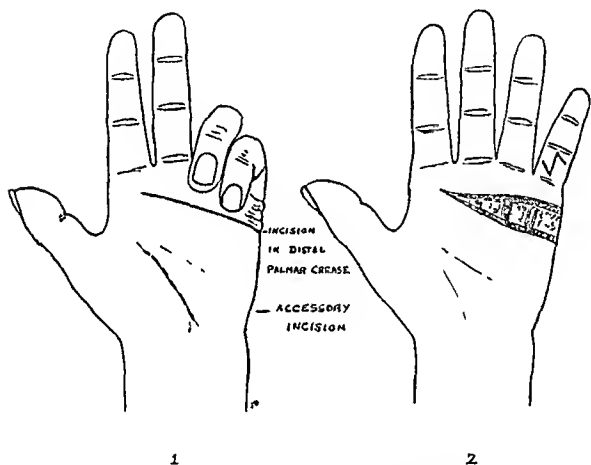
1   2
Fig 1 Incision in Distal Palmar Crease
Fig 2 Gap due to skin defect at ulnar end of transverse palmar incision

Subcutaneous division of fibrous bands in the fingers is dangerous because the digital nerves may lie between the layers of fascia comprising these bands

If, after aponeurectomy, a considerable gap exists (Fig 2) at the ulnar end of the transverse palmar incision, the following plan may be used A dorsal triangular flap is laid out, one side of which is the mid-lateral line on the ulnar border of the hand The tip of this flap will lie at some point proximal to the middle joint of the fifth finger (Figs 3 & 4) This skin flap, including subcutaneous tissue, is elevated and is transposed into the gap at the ulnar end of the palmar incision in the manner of a partial Z plasty (Fig 5) The resulting defect on the dorsum of the hand and fifth finger is covered with a split thickness graft (Fig 6)
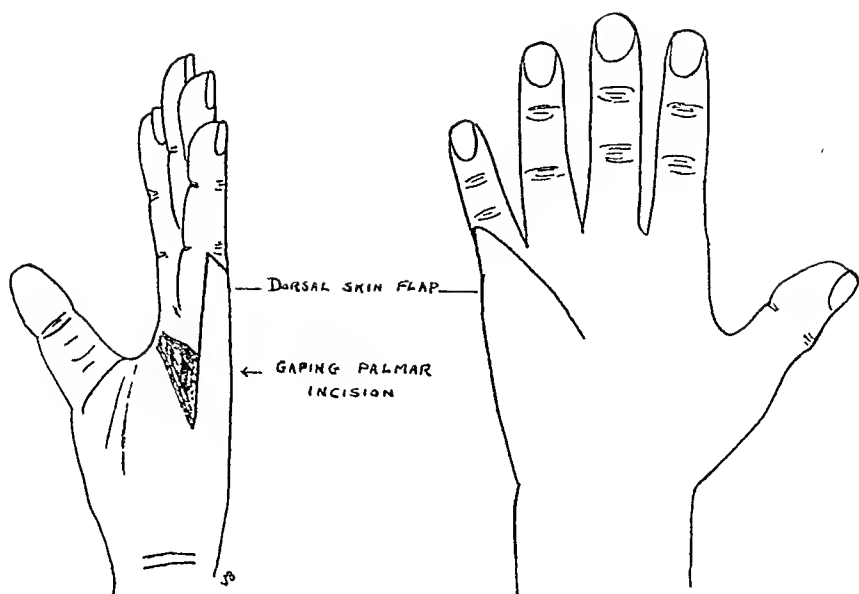
FIG. 3. DORSAL TRIANGULAR FLAP OUTLINED
FIG. 4. DORSAL TRIANGULAR FLAP OUTLINED
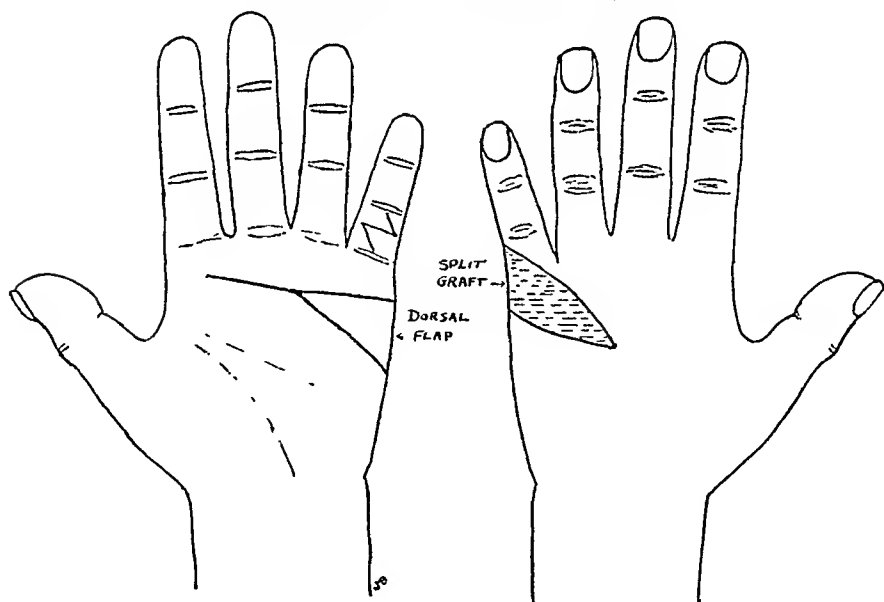
FIG. 5. Dorsal flap elevated and transposed into gap at ulnar end of palmar incision
FIG. 6. Defect on dorsum of hand covered with split thickness graft

Proper dimensions of the dorsal flap are important and will follow the general rules pertaining to Z plasty flaps. In cases where an unusually large flap is required, preliminary elevation (delay) of the flap may be done, so far this has not been found necessary.

The palmar incision may now be closed without tension, and sound healing may be expected if the flap has adequate dimensions. Splinting of the hand is maintained with immobilization of the metacarpo phalangeal joints until healing of the palmar skin is perfect.

The advantages of this method when indicated are as follows. 1. The dorsal skin flap provides a more normal covering for the palm than free grafts because it includes both skin and subcutaneous tissue. 2. In the absence of scars on the back of the hand, such a flap is always available. 3. The resulting suture lines are transverse, and conform to normal flexion creases. 4. Sound healing may be expected if the general rules for local flaps are observed, permitting early motion of the hand and preventing joint stiffness. The substitution of a split graft in a

FIG 7 Pre-operative photo of right hand showing marked involvement of fifth finger and lesser involvement of ring finger

small area on the back of the hand and fifth finger is not disabling and has no serious objections.

The above method is applicable only in those cases where there is a deficiency of palmar skin near the base of the fifth finger, due to shrinkage or surgical excision. The method works best where there is marked, long standing contracture of the fifth finger alone, or where there is marked involvement of the fifth finger with lesser contracture of the ring finger. It is not indicated where the ring finger alone is contracted, the little finger being free. Nor will it relieve contracture of the proximal inter phalangeal joint due to shrinkage of finger skin, Z plasty or skin graft on the finger is necessary for this purpose.

It is emphasized that this method of skin replacement is presented only to supplement other methods currently used. No one method can be used routinely, various methods should be kept in mind to be used when needed. These include the Wolfe graft, the split thickness graft and the abdominal pedicle when indicated.

Amputation with filet and use of the finger skin to cover defects in the palm is occasionally indicated for stiff or hopelessly damaged fingers. In the case of the fifth finger, amputation with filet provides skin in the distal ulnar area of the

palm, where it is needed. However, the little finger is well worth preserving both functionally and cosmetically, and many patients would refuse treatment involving such amputation.

FIG 8 Post-operative photo showing complete extension of fingers, with dorsal skin flap outlined in palm.

FIG 9. Post-operative photo showing normal flexion of all fingers.

FIG 10 Post-operative photo showing inconspicuous split-grafted area on the dorsum of the proximal segment of the fifth finger.

Since the fifth finger holds second place in incidence of involvement (34% according to Davis), it is felt that the dorsal skin flap method described above may have rather frequent application in properly selected cases.

Repair of Dupuytren's contracture of five years duration in Mr H B, age 60, is illustrated in Figs 7–10

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INTERNATIONAL ABSTRACTS
OF PLASTIC AND RECONSTRUCTIVE SURGERY

GRAFTING

Hynes, Wilfred, and Macgregor, Alastair G.: The Use of Fluorescein in Estimating the Blood Flow in Pedicled Skin Flaps and Tubes. *Brit. J. Plast. Surg. 2:* 4 (Apr.) 1949.

Hynes and Macgregor describe a modification of the fluorescein test designed to enable them to estimate the circulatory efficiency of pedicled skin flaps and tubes. They suggest that the test should be carried out on the seventh day after each stage of the operation, and if negative, should be repeated every three days. As soon as the test becomes positive it is safe to proceed with the next stage of the operation.

Technic: The test takes place in a room that can be darkened. As ointments and other materials containing a paraffin base fluoresce readily, a preliminary inspection of the skin tube is made with the ultraviolet lamp. Any areas of fluorescence are cleaned with an ether swab. A bowel clamp (with the blades protected with rubber) is placed firmly across the end of the tube which is to be divided. A series of intradermal wheals are raised at intervals of 2 to 4 cm. along the length of the skin tube by injecting 1:1000 solution of histamine phosphate. The most proximal wheal is placed at a point on the pedicle the circulation of which is being tested; the most distal wheal lies 1 cm. from the bowel clamp. In patients who have a scar between the pedicle and the normal skin (eg., at the wrist inset of an abdominal tubed pedicle) the proximal wheal is placed on the normal skin adjacent to the insertion of the pedicle.

The fluorescein (10 c c of n 5 per cent solution in water with 5 per cent sodium bicarbonate) is injected intravenously, and the room is darkened Under the ultraviolet lamp, fluorescence is detected at the proximal wheal and its subsequent course along the tube is noted

The test is considered negative when one or more of the wheals do not fluoresce, and positive when all of the wheals fluoresce

The authors compare this fluorescein test with the atropine test described by Hynes in the October 1948 issue of the *British Journal of Plastic Surgery* His technic for the atropine test is as follows The end of the tube or flap the blood supply of which is to be tested is temporarily occluded by a bowel clamp, and after an interval of 10 minutes, atropine ($\frac{1}{20}$ or $\frac{1}{30}$ grains dissolved in 0 2 c c of water) is injected into the fat of the flap at a distance of 1 cm from the clamp The time required for absorption of the atropine into the general circulation (detected by the occurrence of tachycardia dryness of the mouth and paralysis of visual accommodation) gives the measure of the blood supply of the injected area

Hynes and Macgregor consider the two tests to be equally sensitive The atropine test is simpler to perform and may be used routinely at the bedside In these instances in which the atropine test seems contraindicated (eg, if the patient has a tachycardia) the fluorescein test may be used

Cannady, John E Cutis Its Various Uses in Surgery *J Internal College Surgeons 11* 282 (May–June) 1948

The importance of the use of cutis in surgery is stressed again by Cannaday It is considered by the author as an ideal material for ligation of the common carotid and other large vessels

New, Gordon B, and Devine, Kenneth D Skin Grafting Methods and Their Indications *S Clin North America*, Aug 1946, p 890

The indications for the various types of skin grafts and flaps now used in plastic surgery are reviewed by New and Devine The dissected full thickness graft taken from behind the ear or from the upper eyelid is preferable for a small clean wound on the face The thick split graft is indicated in the release of contractures, thinner split grafts being applicable as linings to replace absent mucous membrane and as coverings for large granulating surfaces Very thin split grafts are now used only as temporary covering for large unclean granulating surfaces The authors also mention the use of hair bearing scalp flaps for restoring a normal hair line, the sickle forehead flap for the reconstruction of half a nose or a tip and the cervical flap in which skin from behind the ear is included, for some defects of the lower half of the face in men They discuss the use of the cosmetically acceptable skin near the sternoclavicular junction for the repair of certain defects in the face and neck

Goldenberg, B Small Dermis-fat Grafts (Pequenos Injertos de Dermis grasa) *Bolet y Trab de la Soc Arg de Ciru janos 9* 153 1948

Goldenberg believes that the best way to correct small depressed scars is to slide over neighboring tissues If necessary a small flap of subcutaneous tissue can be transferred to fill the defect Whenever this simple method is not feasible the depression must be corrected by lifting the scar with a buried graft The choice of the graft is discussed and the use of dermis fat grafts is advocated These *are preferable to fascia dermis alone and* adipose tissue The use of adipose tissue is not recommended as it has a strong tendency to become absorbed and is frequently attacked by infection

Dermis fat grafts taken in one block have excellent vitality Besides the wound left in the donor zone is easily closed The peeling of the overlying skin is a bit tiresome, but the dermal layer affords a good hold for the stay sutures These are a very important adjuncts to a successful take

The technic for obtaining the dermis fat graft is described at length Particular stress is put on the use of stay sutures to hold the tissues The bed for the graft is prepared under the scar The holding threads are sutured through the skin of the periphery with straight needles The graft is drawn in place and held by knotting the sutures over small pieces of rubber After suture of the wound, a snug pressure ...

mation of hematoma and undue swelling. In a few cases good results were obtained by this procedure.

Rivas, Carlos I., and Tuccillo, Oscar J.: Total Free Graft of Nail and Nail Matrix. (*Injerto Total de una y matriz ungueal.*) *Bolet. y Trab. de la Soc. Arg. de Cirurjanos. 9:* 453, 1948.

A case in which an infection of the thumb was followed by the loss of the distal phalanx of this digit is reported by Rivas and Tuccillo. After excision of the scar tissue the finger tip was shaped to a more normal looking form. In a second stage a square piece of skin was resected from the dorsal aspect of the first phalanx. In this way, by undermining the border corresponding to the nail matrix a bed was prepared for the nail graft.

The nail of the first toe of the left foot was dissected as a hole, comprising the nail bed and the ungual matrix. On the lateral sides $\frac{1}{4}$ cm. of the skin was included in the dissection, while on the basal part skin of $\frac{1}{2}$ cm. thickness was taken. The graft was carefully laid on the bed prepared in the thumb. Fine interrupted sutures were used to fix the borders. A pressure dressing was applied and good immobilization completed the procedure.

This technic has already been used in two cases, with excellent results.

NOSE AND MOUTH

Maliniac, Jacques W.: Role of the Septum in Rhinoplasty. *Arch. Otolaryng. 48:* 189 (Aug.) 1948.

Maliniac discusses the anatomic and surgical relationship between septal and external nasal deformities and classifies septal deformities.

Certain principles of repair are recommended for these different deformities. The timing of repair is an important factor. If the deflection is of such a nature that it interferes with the successful performance of rhinoplasty, the repair of the deflection should be carried out at the same time as the rhinoplasty or before the latter is undertaken.

Havens, Fred Z.: Cleft Lip and Palate. *Arch. Otolaryng. 48:* 9 (July) 1948.

The importance of extending the dissection beyond the base of the hamular process in repairing cleft palates by the Wardill procedure is stressed by Havens. The advantages of using the Veau operation in correcting anterior clefts of the palate and of the alveolar process are pointed out. This operation may be combined with repair of either single or double cleft lips.

Ludwick, Paul G.: The Rehabilitation of Cleft Palate Patients. *Am. J. Orthodont. 34:* 235 (Mar.) 1948.

The plan made by Nebraska of incorporating dental care and rehabilitation of speech in the Program for the State's Crippled Children's Service is presented by Ludwick. The importance of not dropping these cases after surgical treatment has been completed is emphasized by the author.

EAR

Brown, Adolph M.: Protruding Ears: Plastic Correction; Planning Technic; Operation. *Arch. Otolaryng. 47:* 809 (June) 1949.

The established technic for correcting protruding ears that has been published several times heretofore by other authors is again described by Brown. The only addition is that the author recommends making preoperative preparation for surgery on each ear by constructing it in a latex model. Using this model he practices the operation proposed for the individual case.

Editorial Comment: It hardly seems necessary for the trained plastic surgeon to go through the extra steps suggested in this article.

Peer, Lyndon A.: Reconstruction of the Auricle with Diced Cartilage Grafts in a Vitallium Ear Mold. *Plast. & Reconstr. Surg. 3:* 653 (Nov.) 1948.

Diced autogenous cartilage pressed between vitallium molds is suitable for either partial or total reconstruction of an auricle. Peer's method is given in detailed illustrations along with his more recent modification for reshaping the helix and deepening the concha.

Autogenous cartilage is the material of choice, because it survives as living tissue and resists absorption This is in contrast to preserved cadaver cartilage, which some times is absorbed For children with a long life expectancy the latter type of graft is contraindicated However, when both auricles have to be constructed, autogenous cartilage is supplemented by preserved ca daver cartilage in order to fill the molds with sufficient quantity

The first stage of the procedure is started at the pre school age, preferably at 4 years The proper sized mold can be determined by using the normal ear for comparison It is interesting to note that at this age the child's ears are only slightly smaller than those of the parents In proportion to height and head size the child's ears are large

Children with congenital anomalies of the external ear always have a normal inner ear and hearing is possible by bone conduction, middle ear deformities are usually present with external ear anomalies

Operations to expose the drum membrane are useless in cases of meatal atresia because the membrano is never present When bilateral meatal atresia occurs, bone con duction is utilized with a hearing aid thus allowing the child to develop a better speak ing voice

Variations from the author s standard procedure are used under certain conditions namely

(1) When the ear canal and drum are present with the concha, or when the skin in the ear region is scarred In such cases the cartilage mold is transplanted in the neck skin and is shifted into position at a later date by a vertical neck tubed pedicle flap This can also be used if fistulae are present in the ear region

(2) When the ear canal and a reasonable portion of the helix are present

INJURIES

Braithwaite, F , and Beales, P H Some Observations on Curling's Ulcer Brit J Plast Surg 1 281 (Jan) 1949

As stated by Braithwaite and Beales duo denal ulceration is liable to occur in exten sive burns which cause full thickness skin loss, especially if infection is severe Clini

cal evidence of ulceration is usually present during the second week

The authors present two cases of burns which had hematemeses one terminating in death They observe that Curling's ulcer is probably no more prevalent in burns than in other septic conditions In the authors' series of 1500 cases of burns in eight years, only 0 2 per cent showed postoperative ul ceration They assume that penicillin has been the big factor in reducing infection and permitting early grafting It is suggested that prompt medical measures should be in stituted early if digestive symptoms occur in the seriously burned patient

Owens, Neal Osteoporosis Following Burns Brit J Plast Surg 1 245 (Jan) 1949

Owens directs attention to the fact that Sudeck s osteoporosis has been reported as occurring after first and second degree burns In burns with loss of skin osteoporo sis is a frequent manifestation Owens char acterizes the symptoms and signs of the dis ease as aching pain edema, muscle atrophy cyanosis of the skin and a glossy appearance of the affected extremity The disease is es tablished by roentgenographic findings of a variable degree of irregular bone rarefaction and progressive decalcification In time, there is some recalcification but the return to normal function is sometimes disappoint ing due to the fact that some of the calcium is deposited in the capsule of the joints

Pathologically, there are a disappearance of the transverse striae and a diminution of the longitudinal striae The Haversian canals become very large and the cortex very thin The mechanism of deossification is established as an intraosseous hyperemia, and this in turn produces absorption of the mineral elements of bone

Cases are reported to demonstrate the appearance and treatment of the condition and the sequelae sometimes encountered It is felt that in the burned the problem of osteoporosis is an important factor in the ultimate return to function due to the se quelae Therapy is directed to maintain the patient s metabolic balance especially in nitrogen calcium and phosphorus Early skin coverage to permit voluntary motion

and adequate analgesics to permit activity are indicated.

Moore, F. T., and Ward, T. G.: Complications and Sequelae of Untreated Fractures of the Facial Bones and Their Treatment. *Brit. J. Plast. Surg. 1:* 257 (Jan.) 1949.

Moore and Ward make a plea for early recognition of fractures of the facial bones and early treatment. A diagram is presented to show how to classify the injury according to the anatomical fractures. The authors advocate refracture and reduction of malunited fractures rather than substitution treatment. They report on 22 successful cases of correction of diplopia out of 26 cases and compare them with the poor results obtained by similar substitution and camouflage methods.

A surgical method employed and advocated by the authors is described, and their choice of immobilization is illustrated with photographs.

MISCELLANIES

Foged, Jens: Operative Treatment of Abdominal Obesity, Especially Pendulous Abdomen. *Brit. J. Plast. Surg. 1:* 274 (Jan.) 1949.

Foged gives a historical résumé of the treatment of pendulous abdomen by operative therapy. The clinical aspects, the body types, the symptoms, and physical signs of the disease are reviewed. The author states that operative treatment is to be recommended for properly selected patients. A case history and photographs are presented to demonstrate the pre- and postoperative results obtained. A diagram of the numerous types of incision used by various surgeons is included.

The author discusses his results in a series of 38 operations, of which 33 were considered as satisfactory. It is pointed out that a rigid diet will improve the results obtained in these cases.

Battle, Richard: Pressure Sores in Paraplegic Patients. *Brit. J. Plast. Surg. 1:* 268 (Jan.) 1949.

Factors in the formation of pressure sores are summarized by Battle as follows: (a)

complete immobility of the paralyzed patient, (b) complete loss of sensation present below the lesion, (c) the tendency to humidity of bedclothes and skin of the pelvis in one who is incontinent in regard to faeces and urine, (d) the vasomotor disturbances, and (e) the bony skeleton leaving the bony prominences to bear the dead weight. The author admonishes that prophylaxis is the most important step; and general supportive measures, adequate protein administration, blood transfusion, and rigid nursing care are mandatory.

Repairs are by utilization of adjacent skin flaps with strict asepsis, hemostasis, and after-care and removal of the bony prominences, sinuses, fistulae, *et cetera*, as indicated.

Raffaele, A. P.; Poggi, D. A., and Bases, L.: Subcutaneous Emphysema as a Previous Procedure in Lipectomy. (*El enfisema subcutaneo como tiempo previo a las lipectomias*.) *Soc. Arg. Cirujanos. 10:* 73, 1949.

Raffaele and his colleagues report on their experience with subcutaneous emphysema as a preparatory procedure before performing a dermolipectomy. They observed that the injection of a large amount of oxygen. or air into the subcutaneous tissues is a perfect means to facilitate the dissection of the skin and subcutaneous tissues during the dermolipectomy. Hemorrhage is greatly reduced, and the prefascial space is practically dissected by the gas.

The technic is very simple: the needle is introduced under the skin without penetrating to the fascia. Once the needle is in place it is not necessary to move it, for movement of it may cause pain. The use of oxygen is preferred because of a slight possibility of air embolism. Forty-eight hours before the operation, 4 to 6 liters of oxygen are injected without changing the position of the needle. The next day the injection is repeated and sometimes, in very large dermolipectomies, it is given three times. Air or oxygen is introduced with a pneumothorax apparatus. Once the needle is in place, it is connected with a syringe, and the solution is aspirated in order to make certain that the tip of the the needle is not in the lumen of a vessel. To avoid causing slight pain during the insuffla-

tion of oxygen or air into the subcutaneous tissue, the injecting is done very slowly.

This procedure has been performed on 40 patients, with a total number of 67 injections. The results were successful in almost all of the cases. In three patients there was subcutaneous hemorrhage, and in two a discrete emphysema of the thorax and neck occurred with some thoracic oppression, which disappeared spontaneously.

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